

2021

Economic
Expectations

EQ

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Economics Student Society of Australia

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ESSA Melbourne & Monash, Joel Fernando & Sao Yang Hew

Whilst 2021 was supposed to mark the beginning of the post-COVID era (or perhaps post-lockdown), unfortunately as the year progressed the students of Melbourne again found themselves confined to their desks as remote learning became the only viable option. However, not to be deterred, ESSA's writing team continued to follow their economic interests and draw inspiration from the myriad of local and global events that took place over the course of 2021. As ever, our writers explored topics on historical economic thinking, contemporary issues and offered their predictions on the future.

As our news cycles continued to overflow with information, debate and opinion, the focus of this year's Equilibrium publication centred on the social, technological and political change we are currently living through. With such a broad theme, we hoped to encourage our writers to assess their view of the world and pursue a topic that provided a lens to view the future.

Like previous years, EQ 2021 has truly been a cross-campus effort with many students from the University of Melbourne and Monash University investing their time and effort into creating this magnificent publication. We would like to thank all those who have contributed including our sponsors, writers, editors and graphic designers.

We hope you enjoy the read!

EQ *Equilibrium*

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Policymaking in a humanistic society

Understanding how communities interact and respond to policy is as important as ever amid a global pandemic. Join Irene as she explores developments on the social front of economics and how they may change the way we measure a successful society.

"Economics, and indeed human civilization, can only be measured and calibrated in terms of human beings." - The Manifesto for People-Centered Economics, 1997

Introduction

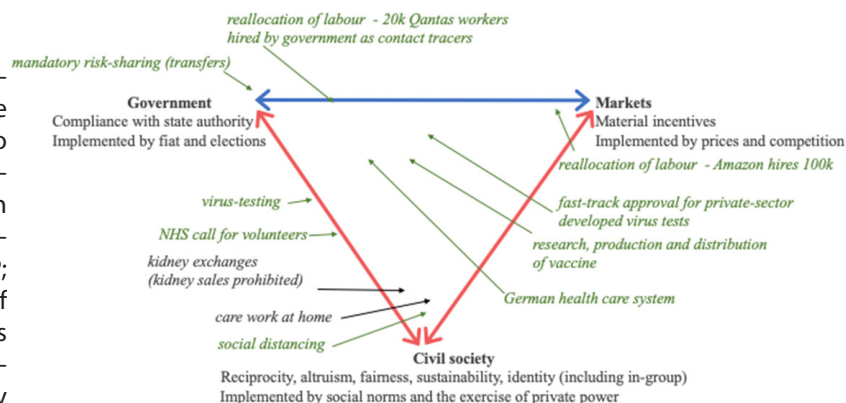
One's first macroeconomics class is a universal experience. We start Macro 101 with an introduction to the primary measure of economic growth – GDP – only to learn about why it is an inadequate measure shortly after. For instance, GDP doesn't capture externalities such as pollution or distributional factors like wealth inequality. Such limitations aren't unique to indicators like GDP; the models you go on to learn throughout the rest of your economics degree continue to make assumptions of perfectly rational, self-interested beings, making perfectly rational and informative decisions that eventually drive the direction of the economy.

However, since the origination of these simplifying concepts, we have made several developments in modelling a more humanistic society. Behavioural economic concepts date back to classical periods, but there has been a surge in attention to its applications in public policy over the last decade. Over time, social factors have increasingly been featured in extensions of economic models and incorporated into the discourse of economists. In this article I discuss how humanistic factors are being integrated into economic frameworks and quantitative analyses of the economy.

Civil Society and Social Norms

The key institutions concerning the study of welfare are governments and markets. Should the state intervene to regulate emissions with a carbon tax or let companies determine the price of carbon permits on the market? Policy design is riddled with such questions. In light of the COVID-19 pandemic, Bowles and Carlin (2020) introduce a third pole into this state-market axis: civil society. Civil society as a mechanism is driven by intrinsic motivations such as fairness and identity, all of which are shaped by individual beliefs and social norms. The diagram below depicts where certain policies fall within this trifactor space.

Varying degrees of compliance with COVID-19 policies across different countries has drawn attention to the importance of social cohesion and the strength of social norms in times of crisis. For example, while mask-wearing



(Source: Bowles & Carlin, 2020)

and social distancing are government-mandated in Australia, compliance mostly relies on the good-will of Australian citizens. Some empirical findings suggest cultures with stricter norms and punishments have fewer COVID cases and deaths per million compared to nations with relatively 'loose' cultures. However, a causal connection remains contentious. Even in culturally 'tight' countries like China and Japan, mask-wearing only became a cultural norm after a history of viral outbreaks. Nevertheless, clearly even the most organised of governments are reliant on the trust of its citizens and their fulfillment of civic duties.

Theoretical consideration of these concepts takes us away from the 'homo economicus' school of thought, whereby humans act rationally with self-interests. Various economic models can be augmented with additional behavioural elements. For example, game theory trees and payoff matrices can be built around assumptions of altruistic values. Alternatively, network economics utility functions can capture conformist values by including a term that assigns negative value to deviation from the 'community average'. Each of these models make some effort to capture the realism of living in a civilised society.

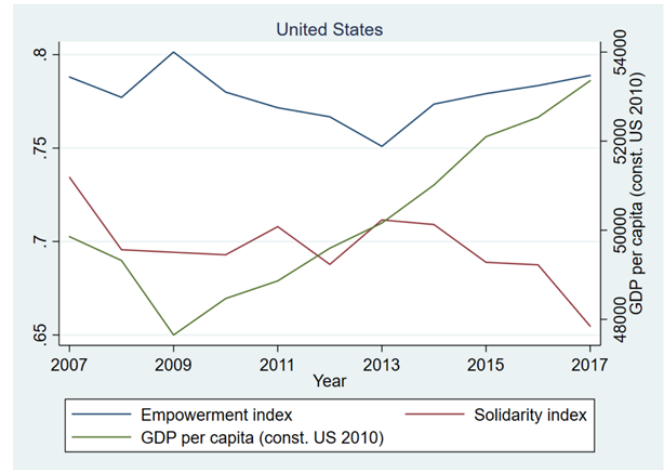
The SAGE framework

Given the importance of these social mechanisms, empirical measurements of a nation’s prosperity also need to capture the successful workings of civil society. The changing social climate in the last decade has seen more mainstream criticisms of high unending economic growth in favour of degrowth. In writing their new open-source economics textbook, Bowles and Carlin (2020) surveyed over 4,000 students across several universities and countries on the ‘most pressing problems economists should be addressing’. Inequality emerged as the dominant issue, while the environment was an equally prominent concern as unemployment. Traditional measures like a country’s GDP may capture economic growth, but not how well a country is dealing with these issues. We need a greater diversity of indicators to gauge and provide a granular picture of a ‘successful society’.

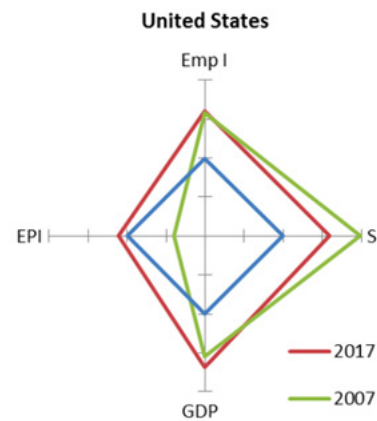
Lima de Miranda & Snower (2020) suggest that conflict and policy issues arise when there is a decoupling between economic and social prosperity. Thus, they have developed the Solidarity, Agency, GDP, and Environment (SAGE) dashboard to measure well-being with a larger focus on cooperation, identity, and intrinsic values within a society. Solidarity reflects social cohesion and a sense-of-belonging measured through data on ‘giving behaviour’ (e.g., volunteering), trust in others and the degree of one’s social support network. Agency uses measures like job security and confidence in institutions to measure empowerment. Both Solidarity and Agency are central to social prosperity, while GDP captures economic prosperity. Environment encompasses both facets of prosperity. While inequality is not included as an economic measure, the solidarity index does capture the negative social externalities that arise from the public’s perception and dissatisfaction with inequality.

This dashboard helps shed light on social problems beyond the negative shocks of recessions. An inspection of the US dashboard below reveals that since the GFC, economic growth has become decoupled from measures of Agency and Solidarity. Lima de Miranda & Snower (2021) argue that the rise in GDP in the years before Trump’s election masked underlying discontent that heightened his appeal as a leader. A similar analysis of the U.K. uncovers that Brexit was preceded by large falls in Agency and Outward Solidarity despite the growth of Inward Solidarity and GDP. Effective policy and the future prosperity of nations will involve generating a better balance of these 4 factors.

Lastly, it is acknowledged that the SAGE dashboard is but one prominent example of how indicators have developed to better capture the major challenges of the 21st century. The Edelman Trust Barometer is another survey that measures the credibility of businesses, government, and media. The 2021 results for Australia show that overall trust has increased year on year, but the rise is largely driven by the informed public rather than the mass population. This per-



(Source: Lima de Miranda & Snower, 2020)



sistent gap in trust equality suggests these institutions are consistently unable to communicate meaningfully with a specific - often vulnerable - demographic. The costs of misinformation to social prosperity are further magnified in the context of a public health crisis.

Once there is sufficient data collected from the COVID-19 pandemic years, it will be vital to revisit these indices. Evaluating how well our policymakers maintained the balance of economic and social prosperity in times of crisis will provide another lens through which economists can dissect potential government or community failure.

Emissions trading 101

'It is unequivocal that human influence has warmed the atmosphere, ocean and land.'

- IPCC Assessment Report 6, 2021

As highlighted in the latest IPCC (Intergovernmental Panel on Climate Change) report, it is the eleventh hour for climate action. The measures to combat climate change can broadly be classified into one of two categories: (1) climate adaptation and (2) climate mitigation. Climate adaptation is the act of becoming more resilient to changes in the climate, occurring due to past greenhouse gas emissions. These activities can range from something local such as building a flood barrier in a city to something more nation-wide like building infrastructure that can withstand higher temperatures. Adaptation measures also vary across countries, and from one region to another, since not all places on earth experience the same effects of climate change. On the other hand, climate mitigation measures are activities that are designed to avoid further climate change by limiting greenhouse gas emissions. These measures are not localised, and their efficacy depends on the method of implementation across countries. Climate change mitigation measures include: (i) Carbon Capture and Storage (CCS), (ii) Command-and-Control regulation, and (iii) market mechanisms like carbon pricing and cap-and-trade (also known as emissions trading).

Carbon Capture and Storage (CCS) is a climate mitigation technique that involves capturing carbon dioxide that is produced in industrial activity, and storing it deep underground for centuries, or even millennia.¹ This prevents the carbon dioxide from ever reaching the atmosphere, thus abating further global warming. Although this system is currently being used, its scale is not large enough to make it a prominent mitigation method. This, along with the high costs of investments required to build the necessary infrastructure and the risk of carbon 'leaking' from its storage discourages investors.²

The second mitigation action available is Command-and-Control regulation. In regard to climate change, this involves the implementation of an overarching policy or regulation regarding emissions, from a central authority such as the government.³ For example, the government may apply regulations to the production technology used in a certain industry by stating that it needs to emit the lowest amount of greenhouse gases possible. This type of regulation asks organisations to comply with certain standards set by the government, thus allowing them very little flexibility in how they choose to reduce emissions. It also burdens all firms with equal responsibilities regardless of their share of emissions or the scale of their firm.⁴ One potential drawback/issue is that small firms may

face higher relative costs than large firms to implement the same technology. In these ways, Command-and-Control regulation is inequitable to implement. On the other hand, market mechanisms like emissions trading and carbon price/ tax work on the basis of 'market forces', rather than some external directive or regulation from authorities like the government, as seen in Command-and-Control regulation.³ This method lets the market work out the appropriate pricing according to demand and supply.

The first major use of market mechanisms to reduce emission levels is found in the Kyoto Protocol, signed in 1997 by 192 countries. It stated that the 38 developed countries that signed the protocol could use emissions trading to supplement their efforts in limiting greenhouse gas emissions, under Article 17. The allowed emissions of each country were divided into Assigned Amount Units, which countries could trade with one another.⁵

This system of trading emissions in a market is popularly known as the Emissions Trading Scheme (ETS), also called the 'cap-and-trade system'. Under this system, emissions for each participant are capped at a certain amount for a given period of time by a central authority such as the government. The total permissible amount of emissions is then divided into tradable units or permits and sold to each participant as per their requirement.

If someone fails to contain their emissions within the allocated units/ permits, then they would need to buy more units from someone willing to sell them. In this way, a market for emissions is created where they can be traded like any other commodities.⁶

It is worth noting that emissions trading is a quantity instrument to reduce greenhouse gas emissions. Here, the price of the traded permits is determined by the demand and supply for such units in the emissions market, rather than being set by a central authority. According to Philibert,⁷ in the long-term, using quantity-based approaches is better, in the sense that it brings people closer to emissions reduction by actually capping the amount of emissions. This is unlike the carbon pricing mechanism where the price per unit is set, and quantities are left to be determined by the market.

The rationale behind emissions trading is simple. When someone (say, a firm) produces something, the only costs it incurs is those involved in the process of production,

such as the cost of the capital (machines, technology, etc.), and the wages it pays to its labour. But, in the process of production, there may also be the emission of greenhouse gases. The 'costs' of this, which are the effects of climate change, are not accounted for. According to van Kooten,⁸ "...the supply function may not embody all of the costs of producing goods and services, in which case market prices are no longer reliable". That is to say that the price at which the final product is sold/ traded in the market does not reflect the true cost of production since it does not include the cost of emission. Hence, the price signals sent by the supply function will be inaccurate, resulting in the market producing an excess of greenhouse gas emissions, thus market failure.

The failure to account for the cost of emissions in the overall production cost causes what is known as a 'negative externality' in economics.⁹ When a firm does not pay for its emissions, the cost is borne by society as a whole, say, the future generations that will face the dangerous effects of climate change. So, it can be said that the 'private' cost faced by a firm in production is lower than the 'social' cost from the same production process, which includes the cost of the externality. This difference in costs also translates to marginal costs i.e. the increase in cost from one additional tonne of CO₂ emissions.

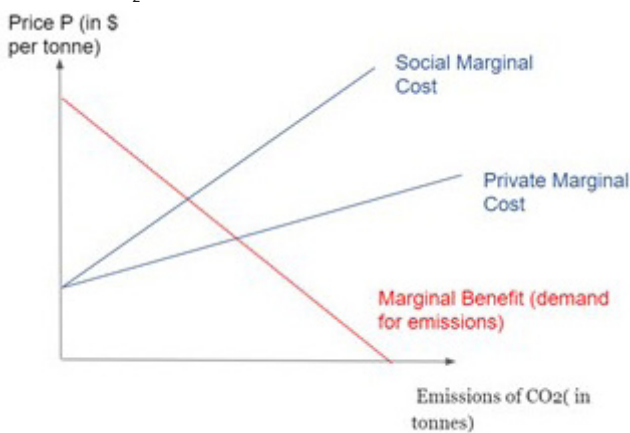


Figure 1. Difference in social and private marginal costs.¹⁰

Figure 1 represents the demand for emissions of CO₂ (in tonnes) with respect to its price in dollars(\$). It can also be understood as the willingness to pay a certain price for one additional tonne of CO₂ emissions.

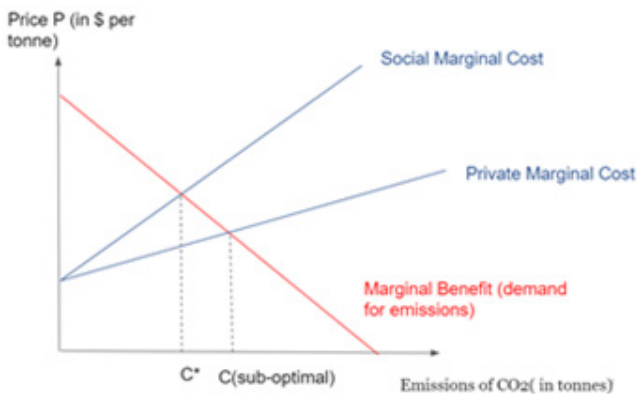


Figure 2. Different levels of emissions.¹⁰

As figure 2 shows, only considering the private costs causes C tonnes of CO₂ emissions which is sub-optimal and as previously mentioned, sends inaccurate price signals. On the other hand, including the cost of emissions and considering the social marginal cost causes the emission of C* tonnes of CO₂. This is the optimal amount because it includes the negative externality from emissions. To force firms to emit C* levels of CO₂, they need to be forced to internalise the costs borne by society as a result of the firm's production processes.¹⁰ This is where the Emissions Trading Scheme (ETS) comes in. By pricing each unit or tonne of CO₂ that firms produce, the government gives them financial incentive to invest in, and innovate more efficient technology and become less carbon-intensive in their operations. This is one of the most distinctive features of emissions trading. Command-and-control regulation does not really provide incentive to go beyond the regulatory standard of technology.¹¹

Emission trading can be organised at both the international and national level. The Kyoto Protocol is an example of an international emissions trading market where buyers and sellers are the signatories of the protocol whereas in a national market it would be organisations and corporations within the country.

The emissions trading scheme is currently implemented in the European Union (EU), which is the largest carbon market in the world. It works on the principle of reducing total emissions, so the cap on emissions is reduced over time. It includes gases such as carbon dioxide (CO₂), nitrous oxide (N₂O), and perfluorocarbons (PFCs). Between 2005 and 2019, they were successful in reducing emissions by about 35%.¹ The UK also has a similar emissions trading scheme in place, which came into effect on 1 January 2021, to serve as a replacement for the EU's emissions trading scheme(ETS), after Brexit. The UK ETS was established with the country's 'net zero by 2050' commitments in mind.¹² Another major emitter that introduced ETS is China. Its emissions market is also set up with its Paris Agreement goals in mind, though the price of one unit traded in China's market is significantly less than the prices in the EU ETS or UK ETS.¹³

Considering everything, emissions trading is a significant and useful climate change mitigation strategy. It is a market-based mechanism, which means it is self-regulating in regard to the prices that are charged per unit of emissions traded. It has also been successfully established in a number of countries, most notably in the EU, and contributes significantly to emissions reduction. It seems like emissions trading is indeed a policy worth implementing in more countries to try and mitigate the effects of climate change.

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Edward Meehan

When medicine fails

Why hasn't a better resourced mental health system led to better results? Edward Meehan investigates why more funding is not always the answer.

A little over a decade ago, Australian of the Year Professor Patrick McGorry used the platform afforded by his role to call on politicians to increase funding for mental healthcare (1). Such calls have only grown louder over time, and have been particularly ubiquitous during the COVID-19 pandemic, which has caused a global spike in mental illnesses (2). Governments have responded with highly publicised spending packages; however, research suggests that levels of psychological distress have remained effectively unchanged. These findings casted serious doubts over the efficacy of current approaches. A more nuanced consideration of the successes and failures of mental health treatment and how to build upon them, rather than a crude spending increase will be needed if real improvement in outcomes is to occur.

Two decades of increasing spending with little to show for it...

Government investment in mental health care has increased consistently since the 1990s - per capita spending, adjusted for inflation, now sits approximately twice as high as it did during the turn of the millennium (3). This has also been accompanied by increased institutional commitment to the issue. Most states and territories have created new ministerial portfolios for mental health, and have publicly endorsed National Mental Health Action Plans (4).

Spending is up but mental illness isn't going down

Annual mental health expenditure per capita versus % of population with a very high Kessler10 (K10) mental health score

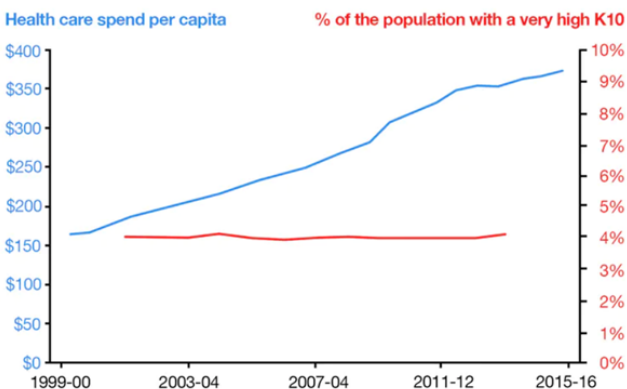


Figure 1: Retrieved from the article "Three charts on why: rates of mental illness aren't going down despite higher spending" (5)

Nonetheless, a 2019 study shows that mental health outcomes in Australia have not measurably improved across the same period (3) (see figure 1). Evidence from New Zea-

land, England, Canada, and the US paints the same picture: funding has been multiplied and medications and therapy are more available than ever, but all objective measures of psychological distress have flatlined or worse (6).

This observation seems paradoxical, given we have strong evidence from randomised controlled trials that psychiatric treatment is effective for individual patients (7).

A reasonable hunch may be that more undiagnosed mental illnesses are being uncovered these days due to greater awareness, concealing the true effectiveness of spending increases. But the researchers specifically guarded against this. They based their assessment on levels of psychological distress using the validated K-10 questionnaire (3). The K-10 measures symptoms themselves, so an increase in diagnosis does not explain away the lack of improvements.

Instead, a closer look at the drivers of this trend is needed.

The candidate explanations...

One possibility is that there are confounding variables at play which have aggravated mental illness in recent years. The increased spending may then have been successful in securing improvements, not in absolute terms, but relative a counterfactual situation would have been otherwise. This could certainly be a contributing factor, though it is difficult to quantify the extent of its impact.

Another interesting possibility is that we may have reached the 'flat of the curve' in psychiatric service funding, a popular concept in health economics. This term refers to the observation that increasing spending improves outcomes when starting from a point of low health expenditure, but that the health benefit of additional funding progressively decreases thereafter (8). Eventually, the "flat of the curve" is reached, at which point even large increases in spending will lead to only marginal improvements. The reason for this is that the first things that money is spent on are (hopefully) the most lifesaving: for example, antibiotics and sterile instruments. After these bases have been covered, seemingly equal spending starts to cover interventions which are less beneficial, increasingly specialised, and more expensive on average (8). This results in the diminishing utility and flat of the curve which gives the phenomenon its name. Another reason for the phenomenon is that at high levels of expenditure, supply can start to lead demand as doctors offer interventions of questionable benefit. Some forms of

asymptomatic screening fall into this category (8).

Applying this to mental health services, perhaps now that first line interventions such as medication and cognitive behavioural therapy are widely available, additional spending only really adds to delivery of less efficacious or surplus services.

However, looking only at the gross headline figures for spending and mental health is far too crude and misses key facts.

A closer look at the data reveals that rates of expenditure and mental illness vary enormously between areas of economic privilege and privation, and between the city and the country. Government subsidised GP mental health services have grown and are accessed at similar rates across all levels of socioeconomic disadvantage. However, government subsidised specialist care is accessed far more in high income areas (3). The blue line on the following graph plots data on the use of the Medicare item for a one-hour psychologist session by socioeconomic advantage. It shows that in the poorest areas, where psychological distress is most prevalent, government subsidised visits are accessed the least.

Mental health service use and disadvantage

Mental health service use vs % of population with a very high K10 score, by area of socioeconomic disadvantage (IRSD scale)

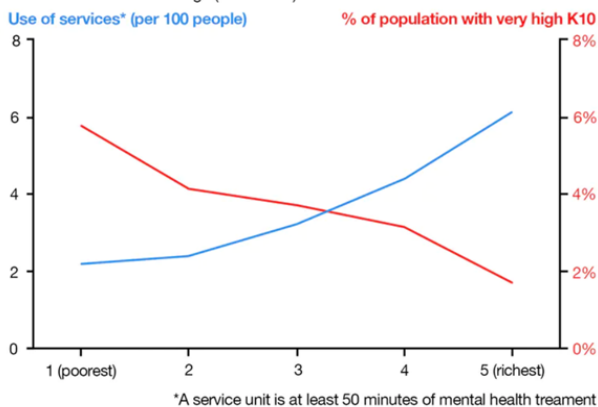


Figure 2: Retrieved from the article "Three charts on why: rates of mental illness aren't going down despite higher spending" (5)

The implication of this goes further than simply pointing out inequality. Instead, if theory from the social sciences were treated like gospel, it may explain why increased mental health spending and treatment has not improved Australia's mental health.

Writing in the Australian and New Zealand Journal of Psychiatry, researchers led by Monash Professor Richard Meadow link this data with ideas from social theorist Ivan Illich, who suggests that the act of medicalising psychological distress can make it worse (3). Illich may go too far in this conclusion, but the underlying principles are important. His theory posits that if left to their own devices, people with mental illness employ self-help strategies such as exercising to deal with their condition. However, when these people are told there is a medical cause for their problem, they place their faith in medical solutions such as medication, viewing

them as the path to wellness and crowding out their own efforts at self-help. When medical treatments are highly effective this may not be an issue, but when treatments are only slightly helpful, the reduction in self-help action may mean medicalisation does more harm than good.

If this theory were true, the effect would be most pronounced in disadvantaged areas where treatment is likely to be less effective. This is because the best outcomes are achieved when psychotropic medications are combined with specialist therapy and strong encouragement of self-help coping strategies (9). Conversely, medications in isolation have been shown to be far less effective. In poorer and more remote areas, the accessibility of specialist mental health care providers is far lower, and treatment tends to fall on GPs, who necessarily have less spare capacity to provide comprehensive treatment (3). Monotherapy with medication is thus often the only option, and the much more modest benefits could be significantly offset by a drop in self-help behaviours.

This suggests poor access to specialist mental health services in disadvantaged communities may be more than just unfair. It may be actively undermining the mental health of Australians.

Towards solutions...

So, is improving specialist coverage in disadvantaged areas the answer? It certainly seems like an important step. However, part of the reason that access is poor in these areas is that it is difficult to develop. Clinicians need to be attracted to work there, and the traditional approach of setting up bonded programs and financial rewards has a questionable cost-benefit ratio (10). Significant reform is likely needed to remedy the situation, not just more money.

Another important step may be considering a broader range of tools. Mental illness, and indeed all disease, is influenced in huge part by the economic and environmental conditions we live in (11). Given spending increases on treatment have struggled to yield results, it is worth considering whether redirecting some of that funding into other social services, such as housing and the environment, may be more fruitful.

In Closing...

In reflecting on the problem of flat of the curve healthcare, former editor of the BMJ Richard Smith made the following observation:

"...we live in a horribly oversimplified world where more doctors, more operations [and] more hospitals means more health. It seems to be beyond the wit of any politician to get across the uncomfortable message that more expenditure may mean worse outcomes..." (8)

As Australia recovers from COVID 19, confronting uncomfortable messages about the failures of mental health policy will be the key to creating a healthier tomorrow.

Geoffrey Go

Introductory microeconomics: change in a virtual economy

Do you find society's lack of perfect competition depressing? Step away from reality and explore a virtual economy with Geoffrey as he discusses the existence of perfect competition within this virtual economy and how a virtual economy has been impacted by technological and social change.

Introduction

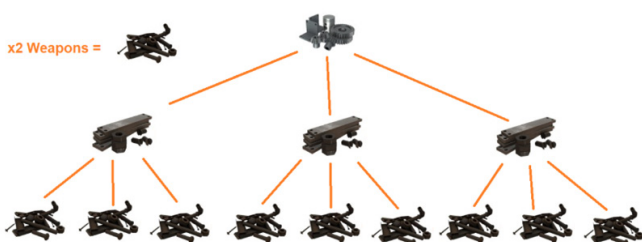
Team Fortress 2 (TF2) is a first-person shooter released in 2007 that was made free-to-play in 2011. TF2's most interesting aspect is the existence of a market where players can trade virtual items with other players. Naturally, this sparked the growth of a virtual economy, where players actively trade virtual items with each other. More importantly, real-world value can be derived from these virtual items as they are purchased and sold for real money. It provides an interesting case study where much of the economic theory we learn can be observed. Although perfect competition is a theoretical market structure that does not exist, it arguably does exist for most common items in TF2.

Background Information

In TF2, the primary currency used in trading are "keys" which cost US\$2.49 in the in-game store but have a real-world value of around US\$1.60-\$1.80. Keys became a currency due to their relative scarcity (as they cost money) and their value is somewhat pegged to the in-game cost of US\$2.49. The most valuable items in the game can sell for thousands of keys.



Much like dollars and cents, "refined metal" (commonly referred to as "ref") serves as the lower denomination of currency to facilitate the trade of low-value items. Refined metal can be crafted using weapons that occasionally drop as you play as depicted below. 2 weapons can be crafted into 1 scrap metal (0.11 ref), 3 scrap metal can be crafted into 1 reclaimed metal (0.33 ref), and 3 reclaimed metals can be crafted into 1 refined metal.



The fact that refined metal is created out of thin air from playing the game has caused mass inflation in terms of the key to refined prices. Keys used to be exchanged at less than 3 ref but are now exchanged for around 60 ref.

Perfect Virtual Competition

Let's consider the characteristics of a perfect competition. In a virtual game such as TF2, each copy of an item is perfectly identical. As the game continues to have a large player base, the number of buyers and sellers who take such a market as given has drastically increased. Information is effectively perfect as traders can observe a complete list of buyers and sellers and their prices, as well as historical 'equilibrium' prices. There are no transaction costs, nor are there any material barriers to entry or exit. These characteristics make TF2 an interesting economy to observe, as they indicate the existence of perfect competition.

Moreover, there is very little 'government intervention' or 'regulation' in the sense that the developers, *Valve*, generally do not intervene in the 'economy'. Developer releases between successive updates (e.g. new items) can be treated as exogenous shocks to demand and supply. There are, however, regulations imposed by the dominant trading platforms used for trading, but these do not affect regular trading activity.

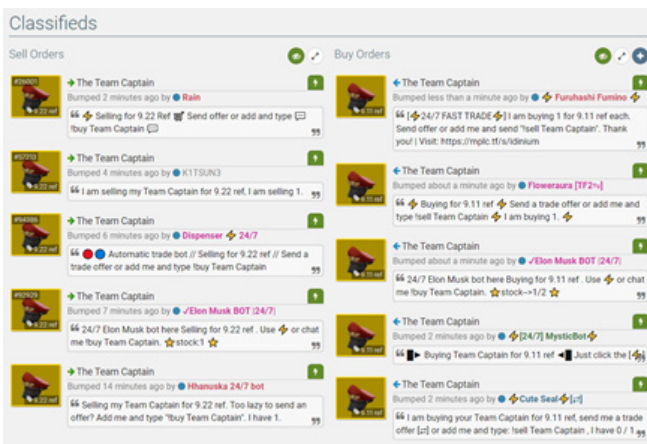
It is worth mentioning, however, that rarer, more expensive items are less competitive due to higher barriers to entry in trading them (high capital requirements) and low supply and demand. These markets provide opportunities to earn "supernormal" profits, that is, profit in excess of normal economic profits.

Technological Change – Automated Trading

Much like we see technological innovations spark change within the real-life economy, technology sparked enormous change within the TF2 economy. Technology was applied via trading bots that enabled traders to accept trades automatically 24/7 without needing to manually accept them. Initially, a few entrepreneurs with good coding skills used these trading bots to launch their own automated trading sites and gained supernormal profits.

However, a developer revolutionised the market by offering a renting service that enabled non-coders to rent and operate their own trading bots for a small monthly fee. This drastically lowered the barriers to entry for automated trading by making them accessible to the general public with no coding skills, which significantly reduced the costs associated with trading (especially time costs). Over time, the entry of these automated trading bots has resulted in an economy that is dominated by these trading bots. The continued entry of trading bots intensified competition, resulting in most low-value items having the lowest possible profit margin of 1 scrap. Figure 1 shows the iconic “Team Captain” hat with a 0.11 refined profit margin on a 9 refined hat.

Figure 1: Top classifieds listings for Team Captain



Considering that a key is currently valued at 60 refined, and a key is worth roughly \$1.80, this gives a profit margin of ~\$0.003 per item. In the age of manual trading, traders required a higher profit margin to compensate for the time and resources involved in trading. Such a hat would have had a 0.33 refined profit margin. Therefore, this new level of “normal profit” can be interpreted as a decrease in average (time) costs due to automated trading.

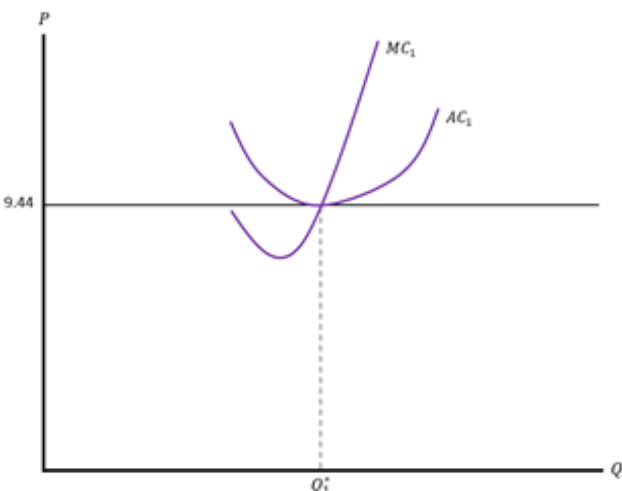


Figure 2.1: Long run equilibrium pre-trading bot age

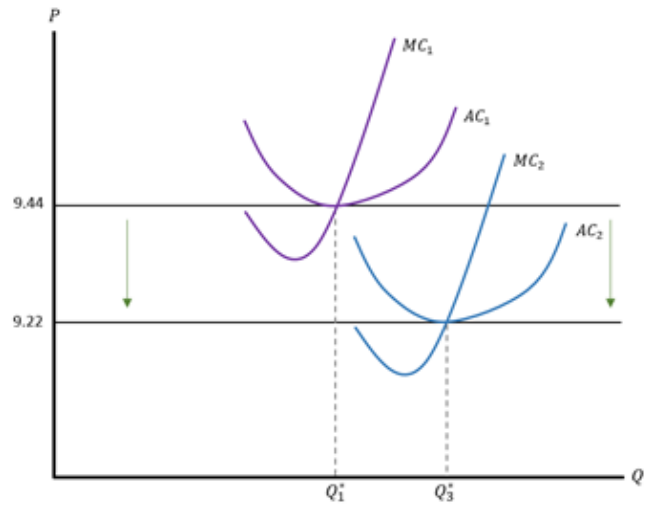


Figure 2.3: Long run equilibrium post-trading bot age

Figure 2.1 depicts the long run equilibrium before the technological change has occurred where price is 9.44 ref and traders make 0 economic profit. Once the trading bots become available for rent, time costs decrease which yields supernormal profits at the current price of 9.44 ref (Figure 2.2). In the long run, more trading bots enter the market to earn supernormal profits, driving the price down to 9.22 which yields 0 economic profit (Figure 2.3).

Furthermore, the concept of price elasticity of demand can be applied here. The price elasticity of demand measures the percentage change in quantity demanded resulting from a 1% change in price.

$$\epsilon = \frac{\% \text{ Change in Quantity Demanded}}{\% \text{ Change in Price}} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

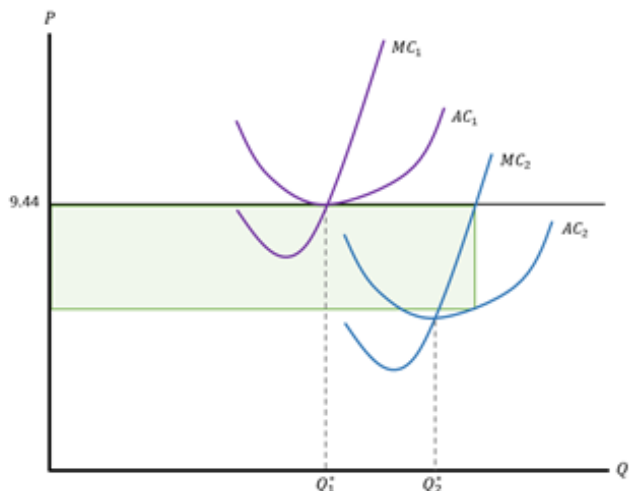


Figure 2.2: Short run equilibrium post-trading bot age

For any individual trader, a seller who raises their price beyond 9.22 refined will have their demand drop to 0 due to the abundance of other sellers for 9.22 refined. This gives an infinitely/perfectly elastic demand curve for each individual trader which is characteristic of a perfect competition.

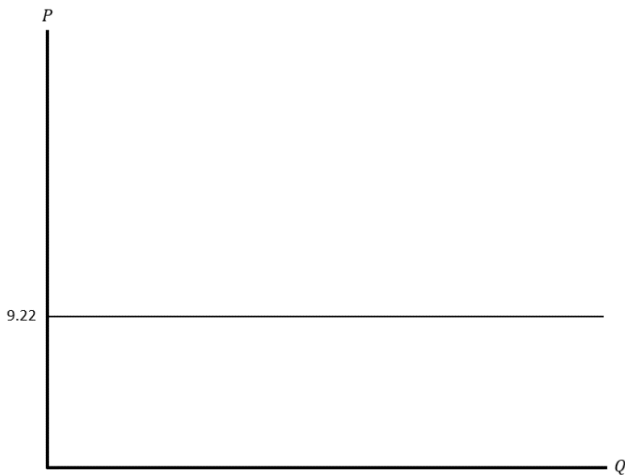


Figure 3: An individual trader's demand curve is perfectly elastic

What are the implications of such a drastic technological change? Theoretically, under perfect competition, traders make normal profits before and after the technological change in the long run. However, for human traders, competing against the vast number of bots is both impractical and unprofitable. These traders are effectively driven out of the market due to an economic loss and must either adapt by getting their own trading bot or focus on markets for rarer items with less competition.

In contrast, consumers have benefited significantly as they can make trades instantly at lower prices and can sell their own items instantly at just below market prices. The TF2 economy highlights just how beneficial technological advancements and competition can be in terms of efficiency and consumer welfare.

Social Changes – Trading with Scammers

The unfortunate reality is that there are always bad agents in society. In our context, a major issue is scammers who scam traders out of their virtual items. This led to the rise of 'SteamRep' which became the main source of identifying and banning scammers. However, the trading platforms went further and punished those who traded with scammers who were 'marked' on SteamRep, *even if it were unintentional*, as well as for trading with *obvious scammer alt accounts*. Multiple violations could result in a permanent ban.

Honest traders were forced to conduct background checks on who they were trading with to avoid punishment for trading with scammers. The idea behind this policy was that scammers can only profit if they can offload the stolen items, which requires people purchasing these stolen

items. Scammers often sold at significantly below market rates to sell the scammed goods as quickly as possible, providing strong incentives for some traders to collude with scammers.

While these views and rules persisted for years, in 2019, the rules were changed so that trades with obvious scammer alts were no longer punished, and background checks were no longer required for trades under 15 keys of value.¹ These changes in 'societal views' are now reflected in regulatory changes have significant impacts on trading activity. Importantly, the dominance of trading bots created a significant issue of trading obvious scammer alts, as this was based on subjective criteria that was difficult to implement. Unsurprisingly, there were many cases of trading bots being temporarily banned as a result of not detecting obvious scammer alts. This impeded the use of bots in high-value item trading. Removing these rules provided confidence that their trading bots will no longer be banned as the other rules were more objective and easily implemented. The competition in these high-value markets have since increased due to the entry of more trading bots.

Conclusion

TF2's virtual economy is fascinating to observe. Its characteristics imply the existence of perfect competition and is almost entirely self-regulated by the community. TF2 provides many examples of how certain changes can affect the economy. The accessibility of automated trading bots to the average trader revolutionised the trading scene as trading bots began dominating the market for low-value items. By reducing the time costs of trading, competition intensified, and profit margins dropped significantly. Although this particularly hurts human traders, consumers benefit substantially from this intense competition through better prices and instant trades. The TF2 trading community has also undergone social change as the community's views on trading with scammers have softened, in part due to the hindrance on trading bots. Ultimately, these examples showcase the impacts of technological advancements and how societal change can shape regulation, both of which our real-world economy will continue to face over time.

What should the value of nature be in economic decision-making

The dual challenges of building a better future together and meaningfully addressing climate change are both intrinsically tied to the value of nature and our relationship as part of the only planet we call home. As I'm sure you're all aware, anthropogenic climate change has begun to impact the world[1] and will cause mass devastation to sentient life[2] - depending on how we respond to it. The character of this response is entirely contingent on the way we value nature. This response has deeper and broader implications for a positive and resilient societal vision of a future that is more synchronous with nature.

Conventional economic thinking and policy has thus far been substandard when applied to environmental economics[3]. In particular, this thinking doesn't adequately capture how to simultaneously approach a wicked problem[4], manage systemic risk, internalise externalities, and solve this global open access problem with complex intertemporal dynamics. Moreover, engaging with these problems requires coordinating nearly 8 billion people and 193 UN member states while ensuring a socially just and green transition.

Establishing a coherent valuation of - and relationship with - nature is fundamental to the economic decisions required to resolve this challenge. People who study economics have a unique role to play in helping to make this decision and we should be exhilarated by the opportunity to address what is arguably the greatest challenge humanity has ever faced.

Why is this a complicated decision?

As alluded to earlier, climate change is a monumentally complex problem that eludes conventional answers and requires engagement from multiple disciplines and perspectives.

This is partly because deciding what the value of nature should be is ultimately a subjective decision that is contingent upon your own perspective, assumptions, and the kind of relationship you think humans should have with nature. Below is a non-exhaustive list of questions that would likely influence someone's view of how to place a value on nature and who is responsible for the resulting decisions:

- Do you value nature intrinsically or only insofar as it meets human needs?

- Do you place any value on non-human sentient beings?
- Should this value be less than or equal to a human life? If less, then how much less?
- To what extent do you value the needs of future generations compared to the current generation?
- Do some stakeholders bear greater responsibility than others? To what extent should a climate response be socially just?
- Do wealthier nations with larger cumulative emissions have different obligations than poorer nations with smaller cumulative emissions?
- Is nature separate from society or are we a part of nature?

Beyond more conceptual and abstract questions, there are a number of complex questions more directly associated with the practicalities of economic decision-making.

For example, nature being an externality in economic decision-making creates substantial implementation concerns via disincentives to act. This makes it such that not only does the value of nature need to be based on accurate information that can be reliably enforced, but it also needs to be a value that a sufficient proportion of economic or political stakeholders agree to uphold.

In order to internalise an externality, conventional economic thinking requires an understanding of what the social cost is such that a Pigouvian mechanism can be established. This social cost is ultimately dictated by the agreed upon value of nature. This process itself is further complicated by the delayed effects of emissions[5], wherein the impacts of today's emissions won't be felt for at least decades. This environmental scenario is inherently harder to evaluate than actions with more immediate consequences.

Given the intertemporal dynamics of climate change and ecological systems, conventional economics requires an appropriate discount rate to assess the cost-benefit analysis of any given initiative and how the proportion of costs should be shared between generations. This is partly determined by the aforementioned philosophical question of how future generations of people and nature should be

valued relative to the current generation.

To illustrate the fundamental importance of these economic questions, William Nordhaus was awarded the 2018 Nobel Prize in economics[6] for his work in the field of climate change economics and discount rates. However, his work has been subject to criticism[7] that he uses exceedingly generous discount rates that allow for a level of global warming that many consider to be unacceptable from both an environmental and economic standpoint. This ultimately reflects the unresolved nature of what value should be placed on nature within the discipline.

Additionally, climate change is associated with existential risk, which complicates calculating the response necessary to preserve nature and what that value should be. This is because it is difficult to assess how to balance a knowable or measurable current gain/loss against investing in reducing the chance of a future catastrophe.

Introducing the System of Environmental-Economic Accounting and the Ecosystem Accounting framework (SEEA EA)

This complexity alongside the diverse approaches to valuing nature has unsurprisingly inspired numerous frameworks and lenses through which to analyse the problem. A recent and promising example of these is the System of Environmental-Economic Accounting and the Ecosystem Accounting framework (SEEA EA). SEEA EA[8] is a UN framework that was newly adopted in March 2021 as a toolkit to answer policy questions regarding the relationship between nature and economic activity, with particular attention to potential synergies and tradeoffs.

In light of the dominance of GDP as a metric for economic well being, new approaches such as SEEA EA help to integrate ecological stability and the contributions of nature. This framework[9] is based on the concept of ‘natural capital’, which asserts that biomes such as lakes and forests add tangible value and form the foundation upon which economic growth rests. In this sense, natural capital becomes integrated into economic reporting in a similar manner to physical and human capital. As such, nature is given a quantifiable value with respect to economic decision making that allows for the internalisation of social costs.

As outlined in the graph below, natural capital has several more intrinsic connections to human and physical capital. This is because nature is considered to be a stock (forestry) that contributes to flows in the form of natural services (photosynthesis) that provide a benefit (clean air) to a given beneficiary (local community). This system of ecosystem accounting allows for the public benefits of nature to be considered, which in turn allows for a fair comparison of nature’s value relative to alternative private uses of that resource. This is in contrast with the status-quo where the environment is externalised and private benefits are disproportionately favoured to the detriment of overall public

good.

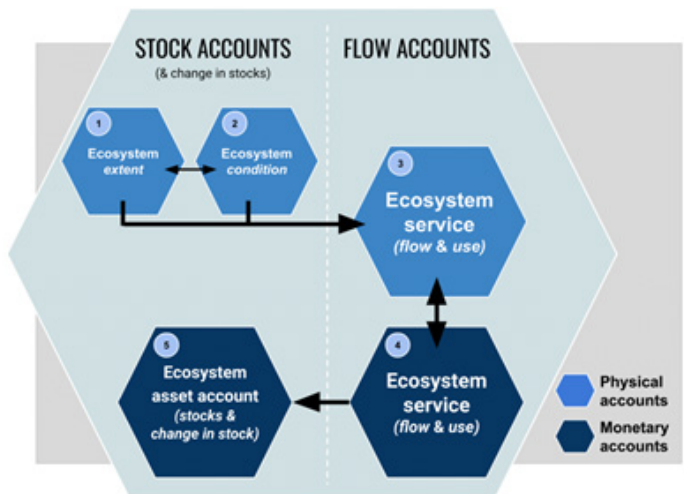


Figure 1: Ecosystem accounts and how they relate to each other

However, this framework isn’t necessarily complete and there are other worthwhile considerations. For example, the SEEA EA is simply a toolkit to be applied contextually and does not purport[10] to be a definitive value of nature. Nonetheless, it can practically inform a number of questions that one would aim to resolve with a value for nature. This could range from a local council deciding whether to build a community centre or preserve land to a federal government evaluating whether to build an infrastructure project that encroaches on the environment.

The fundamental question of how to value nature in a consistent and global sense is left unresolved by this framework and other perspectives need to be considered. SEEA EA only values nature within specific contexts and becomes increasingly complex for flows and services that have global impacts (such as global emissions) beyond the local communities that are directly related. Additionally, the framework presupposes that nature is only valued with respect to human needs without intrinsically valuing ecology. In tandem with this, First Nations peoples have valuable contributions[11] towards environmental preservation and climate adaptation that aren’t factored in sufficiently.

Beyond these concerns, the SEEA EA doesn’t attempt to integrate considerations of justice, responsibility, implementation, or enforceability, all of which require supplementary principles and frameworks.

It is with these considerations in mind that I want to challenge all of us as economists to refine our understanding of nature’s value, so that we can make decisions that lead to a thriving, sustainable, inspiring, and equitable future.

If you’d like to learn more about environmental and climate economics, you can check out some of my previous articles on the topic as well as the sources I used within this article at the end of this document.



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Pinidu Chandrasekera

Why our beloved Olympic Games are under threat

AMID the devastating recent lockdowns across the eastern seaboard, Australians got the gift they didn't expect but definitely deserved.

For two glorious weeks in late July and early August, our everyday discussion switched from case numbers leaked by your aunt's neighbour's godfather at the health department, to the incredible feats of athleticism, sportsmanship, and courage of 486 Australians rendezvoused in the heart of Japan.

Ariane Titmus' epic battles with American legend Katie Ledecky – and almost being overshadowed by her own coach.

World champion canoeist Jess Fox finally breaking through for that elusive gold medal, almost a decade after her Olympic debut in London.

The tears of joy from Patty Mills on the court in Tokyo to Andrew Gaze in the studio as the Boomers secured their first Olympic medal.

The combination of a friendly time-zone, widespread coverage, and half the country being under lockdown contributed to make the Tokyo games arguably the most significant in the eyes of Australians since Sydney 2000. If that alone wasn't enough, only a few days out from the opening ceremony, Brisbane was announced as the host of the 2032 games, becoming Australia's third host of the global sporting extravaganza.

But beyond the pomp and ceremony there has been growing discontent over the financial viability of hosting the Olympic Games. While one would assume that hosting the world's biggest sporting event would bestow some economic benefit – it is unfortunately quite the opposite. Such is the incessant borrowing, crippling debt burden, and widespread disruption to local infrastructure induced by a successful bid, Brisbane won hosting rights for the 2032 games uncontested.

Considering the economics behind the Olympics begins with the bidding and selection process, which typically takes place half a dozen years before the games itself. Putting forward a bid to the International Olympic Committee (IOC) is a considerable commitment costing potential hosts

anywhere between \$50-100 million. [1] The Brisbane 2032 bid required extensive collaboration between all three levels of government, alongside an army of consultants, extensive travel costs, and a sophisticated marketing campaign to showcase the host city's credentials. The Tokyo 2020 bid cost in the order of \$75 million – which is troubling enough for the debt-riddled Japanese economy. But consider the jaw-dropping \$150 million spent by Japanese authorities on the failed 2016 bid and the murmurs of discontent amongst the Japanese public are not surprising in the slightest. [1]

Even if an exorbitant \$100 million bid to the IOC was successful, that cost is merely a drop in the ocean when considering the requirements for hosting the event itself.

Since the latter stages of the twentieth century, the Summer Games in particular have grown significantly in scope – buoyed by an increasingly interconnected global sporting apparatus and burgeoning broadcast agreements. Host cities are now expected to provide 40 cutting edge venues, accommodation for close to 20,000 athletes and their entourages, a media and communications centre, sufficient transport infrastructure for all involved, and stringent security measures to ensure the safety of athletes, officials, and spectators alike. [2]

The venues themselves require extensive planning and careful construction. Olympic sports include niche events which much of the world only engages with once every four years and are not readily available or found in existing infrastructure. From velodromes to aquatic centres, and skate parks to the archery green, it's no wonder the infrastructure spend for most contemporary Summer Games has skyrocketed into the tens of billions. Estimating the exact cost itself has become a fraught exercise. The Associated Press placed the price tag of the Tokyo Olympics at \$15.4 billion, while other sources including Business Insider are quoting even larger figures in the ballpark of \$26 billion. [3] [4] Alarmingly, both estimates for the Tokyo games are relatively low compared to the estimated price tag of \$45 billion and \$51 billion for the Beijing Summer Games (2008) and Sochi Winter Games (2014) respectively. [5]

To put that into perspective, the world's most expensive piece of real estate – Buckingham Palace in London – is esti-

mated to be worth \$4.9 billion. That includes all 775 rooms, 1514 doors, 760 windows and 350 clocks. [6] For the purported price spent on hosting the Tokyo games, the Japanese government could have acquired Queen Elizabeth II's humble abode at least three times over.

Proponents rave of long-term economic development generated by hosting the Olympic Games, underpinned by supposed benefits for employment, tourism, and consumption. Unfortunately, recent history does not provide the evidence to back such claims. While tens of billions are spent on the hosting of the games, the subsequent benefit supposedly falls to the order of \$4-5 billion. [2] Temporary employment opportunities are largely restricted to the city's major architectural and construction firms, and private consumption by local householders may even become disrupted due to the inconveniences to mobility and access to finance.

Of course, we must acknowledge the enormous pride and prestige associated with hosting the world's biggest sporting event. The spectacle itself is awe-inspiring, and even more so when it's happening in your own backyard. But putting that aside, the economic case is dire. Despite the tens of billions spent, the economic benefit is often only derived from broadcasting rights, sponsorship, ticket sales, and licensing. When considering the economic cost, we must also consider the years of social disruption, the upheaval of prime real estate and the long-term maintenance costs of so called 'white elephant' infrastructure projects.

The opportunity cost to the local population and the sheer scale of social upheaval is worse when hosting rights are given to emerging economies. Of the estimated \$45 billion spent on the 2008 Beijing Summer Games almost half went towards transport infrastructure, with another quarter being allocated towards environmental concerns in the densely populated city. Ostensibly, such infrastructure spending prompted by the hosting rights to a major event may sound desirable, but the overhaul of the Chinese capital coincided with the forced eviction of approximately one million residents. Eight years later in Rio, over 22,000 households were evicted from local favelas as local authorities sought to create room for venues and required transport infrastructure. [7]

So why do cities continue to incessantly pursue hosting rights despite all the evidence pointing to long-term economic damage?

The answer comes in two parts.

The first lies in the quasi-arms race of the Olympic Games stemming from the mid-1980s. Following the Munich massacre of 1972, the legacy of debt left by Montreal in 1976, and the American-led boycott of Moscow in 1980, hosting the Olympic Games had fallen out of favour. Within this political environment, Los Angeles was the only city to bid for

the 1984 edition and as a result held significant bargaining power in its preliminary dealings with the IOC. This allowed the city to utilise its existing sporting facilities and infrastructure for the games, and quite remarkably, finished the games with a \$215 million operating surplus – the only host city to ever turn a profit. [5]

Los Angeles' spectacular economic result reignited a global appetite for hosting the Olympics with increased competition for subsequent games. The newfound frenzy was further catalysed by the 1992 Barcelona games which emboldened the economic case of hosting. But like L.A. in 1984, the Catalonians benefited from a unique set of circumstances which could not realistically be repeated by other prospective hosts. For decades under the dictatorship of General Francisco Franco, Catalonia and its capital Barcelona were largely neglected by the central government in Madrid. Franco's death in 1975 initiated a transition to democracy which greatly benefited the citizens of the autonomous region. Buoyed by this newfound opportunity Catalonians enacted democratically elected planning bodies to build Barcelona out of the Francoist dictatorship and saw the 1992 Olympic Games as a perfect opportunity to further their revival. Thus, the Barcelona case saw local planning bodies incorporate the Olympics into the city's planned urban development – essentially making the Olympics work for the development of the local economy. Ultimately, the 1992 games not only facilitated Barcelona's urban development, but also propelled the city into becoming one of the premier tourism destinations in Europe. [2]

With the examples of Los Angeles and Barcelona to draw upon, bidding competition rose dramatically leading into the new millennium. Cities fought to promise the most elaborate and luxurious facilities in a desperate bid to draw IOC support. Naturally, this pushed the infrastructure and construction costs of hosting to significantly higher levels. But alongside this increased competition was not just the increase in raw numbers of prospective hosts, but also a differentiation in calibre as emerging economies including China, Brazil and Russia became involved.

This provides the perfect Segway to the second and more sinister reason for continual interest in hosting the games. The global spotlight offers authoritarian regimes a chance to gain legitimacy and prestige on the world stage.

Jerome Valcke, the former Secretary General of FIFA, encapsulated this reality in controversial remarks made in 2013, "I will say something which is crazy, but less democracy is sometimes better for organizing a World Cup." [8] Unfortunately, FIFA's recent history would suggest that the organisation has the moral fortitude of a paper clip, such that Valcke's remarks are akin to a bank robber acknowledging that security cameras were a hindrance to their business model. Nonetheless it reflects a truism which applies just as well to the International Olympic Committee.

WHY OUR BELOVED OLYMPIC GAMES ARE UNDER THREAT

Moving on from my momentary facetiousness, recent trends in successful bids make for sobering reading from a human rights standpoint. Beijing hosted the Summer Games in 2008, while Russia hosted the 2014 Winter Olympics and the FIFA World Cup in the space of four years. But the real kicker is slated for 2022 when Beijing features again with the Winter Olympics and Qatar hosts the FIFA World Cup.

There are several factors underpinning the recent trends in hosting. The first is the more obvious political impetus for authoritarian regimes to gain legitimacy and prestige by associating themselves with global sporting events. The second is the relative ease with which authorities in these jurisdictions can override the long-term economic concerns of the local population and ensure the viability of the event through coercion.

In 1972, Denver, the largest city in the US state of Colorado, went as far as to reject the 1976 Winter Games it had successfully bid for two years prior. The key reason behind the back-down was strong opposition from citizens and local politicians over economic and environmental concerns. [9]

It is unlikely that we would see similar movements being successful in places like Beijing, Moscow, or Doha.

Left unchecked, especially in the post-COVID economic environment, the viability of the Olympic Games as we know it may be under threat. The IOC must recognise recent trends in the politicisation and economic unviability of the sporting spectacle and enact reforms to incentivise a more sustainable form of hosting. Renowned sports economist Andrew Zimbalist, dismissed by his critics as 'anti-Olympic', points to the Los Angeles games in 2028 as a chance to demonstrate the sustainable alternative. [2] As America's second largest city already boasting significant sports infrastructure, the timing of the Summer Games may even allow organisers to utilise the University of California, Los Angeles (UCLA) for athlete accommodation and training facilities – further minimising the costs involved.

The state of the Olympic Games is at a crossroads, and there is something rather poetic about the Los Angeles games becoming the litmus test – four decades after the city sparked the Olympics 'arms race' of the late twentieth century.

Sport is one of mankind's greatest creations. It allows for the expression of emotions and feats of physical extremity not possible through any other medium. We must never lose sight of the importance the Olympic Games holds as the premier showcase of this great human pastime – and reforming its economic cost is all but the first step in ensuring its long-term viability.

Citius. Altius. Fortius.

Emad Iqbal

Are friendships strengthening education policy outcomes?

What is your average friend worth? Analysing friendship behaviour can help us better understand spillover effects when evaluating education policy.

The tutor learning initiative in Victoria

In light of the current lockdown measures, teachers were required to adapt their learning to online platforms to compensate for the fact that students were unable to attend school physically. These platforms do not provide the same level of engagement as conventional teaching methods, and required students to self-motivate without the supervision, support, and encouragement conducive within a physical learning environment.¹ The barriers introduced by remote learning have evidently impacted learning outcomes with students learning at only 50 – 75% of their usual pace.²

The persistent gap in quality of education provided by public and private schools has only been aggravated in remote learning environments. Students that attend private schools have access to a higher quality of education and generally have better learning outcomes. A switch to online learning has impaired learning at public schools more than private schools due to their limited access to mainly technological resources required to engineer this shift effectively.

As shown within the following plot provided by Grattan Institute, disadvantaged students with specific needs were impacted even further, with their pre-existing problems amplified during the switch to remote learning. Students with limited English proficiency who already presented struggles in a physical learning environment were further hindered by the lower levels of engagement and attention from teachers. This should also be highlighted for disadvantaged student groups e.g., those from low socioeconomic backgrounds, living with pre-existing mental health conditions and/or present in unstable home environments who are most significantly impacted by this change and therefore urgently require assistance.

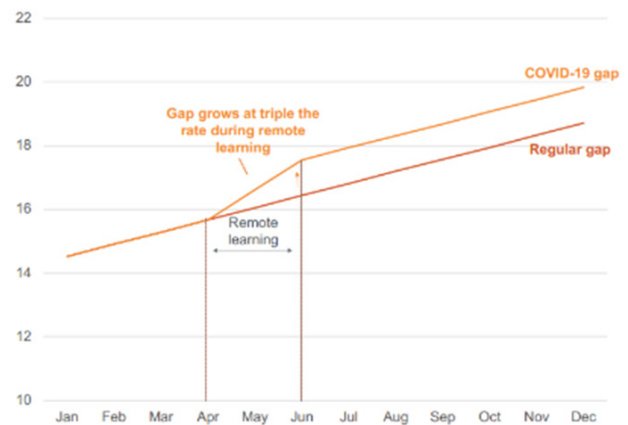


Figure 1: Source - Grattan Analysis

Evaluating the costs and benefits from education policy

Recently, the Victorian government invested \$250m into the tutor learning initiative dedicated to help over 200,000 disadvantaged students catch up in their learning. \$209.6 million of the Victorian investment was allocated to government schools to attract and employ 3500 tutors across the 2021 school year. \$30 million was invested to employ 600 tutors at non-government schools.³

The costs of the program are straightforward to consider, however, it's difficult to estimate the economic benefits in real time. The direct benefits of the program are being evaluated using the change in assessment data for participating students and their education plans. This initiative will better equip students for future learning and participation in the workforce, which will increase the productivity of human capital and increase GDP. By modelling the predicted increase in future wages, an estimate can be produced for the predicted increase in GSP for every \$ invested. Does this estimate truly represent the gains from this policy?

Direct measures only account for the direct change in teaching outcomes for the students participating in the tutoring services. The actual benefit is greater than what's being estimated. This can be explained using peer effects in education.⁴ Students share knowledge from the tutor services with their friends, which increases their educational outcomes and indirectly increases the GDP. Let's analyze

the localized effect by considering the direct transmission of knowledge between friendship groups.

Games on networks

Most students study for their subjects within their friendship groups. On the theoretical drawing board, games on networks⁵ can be used to quantify the economic value from these study groups. Our economic utility for a given level of effort is based on:

What we learn (α) – determined by characteristics such as ability, for example: a high ability student may learn more from a subject given the same level of effort.

Opportunity cost (κ) of studying – how much do we value our leisure, are we really enjoying the 5th re-run of the Big Bang Theory?

Deviating (ϕ) from the social norm.

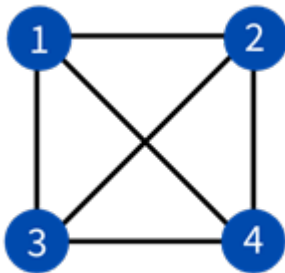
This can be represented using the following quadratic equation:

$$u_i(x_i, x_{-i}; G) = \alpha x_i - \frac{\kappa}{2} x_i^2 - \frac{\phi}{2} (x_i - \bar{x}_i(g))^2$$

Example

Let’s consider a simple illustrative example:

Say we have 4 friends in our study group, which can be represented using the following network:



Without considering the network effect, each student would trade off what they learn against the opportunity cost of studying to determine their optimal level of effort. An initial evaluation would conclude it’s optimal for all 4 students to put in a different level of effort into education.

However, since friendship groups often hang out together, the optimal amount of effort to spend studying also depends on how much effort their friends put in. Armengol et. al.⁶ have shown that with perfect information everyone will put in as much effort as the average friend in their study group. Students who initially exert high effort will converge down, while students who initially exert less effort will converge up towards their ‘social norm’, so all friends study and enjoy leisure together.

Do we really know the social norm?

Often, we don’t know what the ‘social norm’ is. We infer this information depending on what we perceive from the people around us. Are our friends as smart as they come across? Do they enjoy watching Netflix (or are they just trying to keep up with the latest tea)? And how much do we really care about converging to the social norm?

To investigate this, suppose we all start with an initial assumption of what we think is cool (based on our first impression) and with time, based on our observations, we update our beliefs. This behaviour can be modelled by extending the initial game to account for imperfect information in the parameters (α, κ, θ) that determine these values. We find that there is an optimal level of information we should know about our friends to maximise the amount of utility we get from our study group.⁷

Conclusion

Linking back to the education policy to recover from a pandemic, by better understanding how students derive value from their subject we can decompose the spillover effects of our education policy, which are often larger than the direct benefit we observe. By carefully crafting policy around incentives, we can cater towards students who think they are too 2kool4skool.

Diego Machillanda

The case for sustainability in business

We live in troubling times. In 2021, Southern Europe suffered its most extreme heatwave in three decades, with catastrophic wildfires throughout Greece and Turkey. Several countries around the world experienced deadly floods in August alone, including Russia, China, and multiple African nations. In that same month, the Intergovernmental Panel on Climate Change released its latest report confirming that 1.5°C of global warming is all but inevitable.¹ This occurred all in the aftermath of last year's Black Lives Matter protests, which may well be the largest social demonstrations in the history of the largest Western economy.

In the context of these environmental and social dangers, who do we trust to make change for the better? The answer, surprisingly, is business. In the latest Edelman Trust Barometer of 28 countries and 33,000+ respondents, business became the *only* trusted institution among NGOs, government, and the media – and the only one seen as both competent *and* ethical.²

But moral arguments aside, these troubling times have revolutionised our thinking about society, environment, and business. Firms are beginning to see an alternative purpose to only generating value for shareholders, in generating greater shared value between shareholders, local communities, and society as a whole. For example, in 2020 alone investment in sustainable assets increased by 96%³, and hiring for diversity-expert roles on LinkedIn increased by over 90%.⁴ As the CEO of the world's largest investment management multinational firm wrote in his 2021 letter to CEOs, "the climate transition presents a historic investment opportunity."⁵

Change is coming to the world of business. Corporate Social Responsibility (CSR), Environmental, Social and Governance (ESG) factors, Diversity, Equity and Inclusion (DEI), and social impact more broadly are becoming central priorities for firms. But why should businesses care, and do they have a responsibility to act? After all, isn't the purpose of business to make profit for shareholders, and is sustainability in business anything more than mere marketing?

The Logical Case for Sustainability in Business

Milton Friedman famously rejected these concepts of corporate social responsibility in 1970 with his appropriately-named essay *The Social Responsibility of Business is to Increase its Profits*.⁶ He argued that executives who promote

desirable social ends at the expense of profit deal a great betrayal to their employers, shareholders, by not acting in their best interests. This is in line with neoclassical economic thinking, which views any ESG or DEI considerations for a profit-maximising firm as unnecessary constraints that raise its costs and reduce its profits. According to such logic, these constraints are external to the demands of a free market, and hence should be disregarded.

Although this logic became dominant in the decades following Friedman's essay, Michael Porter and Mark Kramer famously rebuked its concepts of shareholder value in 2011 with their essay *Creating Shared Value*.⁷ They denounced its short-sighted interest in financial performance above all else, and lamented the narrow conception of capitalism that has prevented it from flourishing to meet society's broader needs.

Central to their argument was the recognition that societal needs are not external to markets, but instead define them. The social demands of a population become its market demands, and its social harms become a firm's internal costs. As evidenced by the aforementioned rise in demand for workplace diversity experts, social demands for racial justice become employer demands for diversity expertise.

Rather than shareholder value, Porter and Kramer proposed that creating *shared value* should be the strategic imperative of a firm – value shared between shareholders, the firm, and society at large in a win-win-win arrangement. The concept of shared value looks beyond the antagonistic rationality of consumer and producer surplus and towards an integrated understanding of the two. Rather than seeking to maximise their share of surplus, firms creating shared value seek to maximise *total* surplus and the growth of *everyone* involved.

For example, a firm with a shareholder value approach might aim to extract as much produce as possible from the communities in which it operates, with little attention to their material or social conditions. These are typically remote and impoverished communities, where such firms only see cheap labour. But a firm with a shared value approach would seek to invest in their communities, providing them with better training, infrastructure, technology and the like. This enhances their competitiveness and reliability for the firm while simultaneously advancing the economic and social conditions of said communities.⁹

Despite the early hold of Friedman's shareholder value, approaches based on shared value are gaining traction as a way for corporations to secure competitive advantages in today's markets. By embedding sustainability and the co-creation of value into their business strategy and core operations, global firms can best align themselves to the expectations of firms in the 21st century.¹⁰ For firms unconvinced by these expectations and their theoretical arguments, the economic rents associated with sustainability ought to persuade them.

The Evidential Case for Sustainability in Business

The evidence that shared value and sustainability are profitable objectives for firms is simple and compelling. A meta-study of 190+ sources conducted by the University of Oxford concluded strongly that good sustainability and ESG practices are correlated with lower operating costs, greater profitability, and superior share price performance.¹⁰

In the next section, I address some reasons why.

Stakeholder Expectations Are Shifting Towards Sustainability

People in advanced economies are beginning to recognise the impact we are having on our planet – 81% of Americans now accept that the Earth's temperature is increasing, which is the highest level in over 20 years.¹¹ As a result, the expectations that consumers, investors, and broader stakeholders place upon business are intensifying.

Consumers are acting with their wallets, rewarding firms that respond to their sustainability expectations. For example, between 2013 and 2018, 50% of the total growth in the US market for consumer packaged goods came from sustainability-marketed products.¹² The multinational consumer goods company Unilever has claimed that its 'brands with purpose' are growing at twice the rate as others in their portfolio.¹³ And companies that actively practice corporate social responsibility are able to charge higher price premiums, of up to 20% according to some estimates.¹⁴

Supply Chains Are Facing Social and Environmental Risks

Global supply chains are becoming increasingly vulnerable to civil conflict and unpredictable natural disasters. According to McKinsey, the value at stake from these sustainability risks can be as high as 70% of earnings, even before interest, taxes, and depreciation.¹⁵ Consequently, it is in firms' best interests to mitigate these risks.

Shared value approaches have allowed companies like Mars, Unilever, and Nespresso to fortify their suppliers against said risks, such as through Rainforest Alliance certification. This certification ensures that suppliers practice sustainable farming that helps against climate volatility, reduces land degradation, and more.¹⁶ Rainforest Alliance certification has specifically been associated with improved productivity and net income, due to its investment in sup-

plier communities – in 2011 certified cocoa farms in Cote d'Ivoire produced 576 kg of cocoa per hectare compared to 334 kg per hectare in non-certified farms. Or in terms of net income, \$403 USD per hectare compared to \$113 USD per hectare.¹⁷

Addressing Sustainability Challenges Fosters Innovation

Redesigning existing products or developing sustainable substitutes to meet environmental or social needs creates new opportunities for competitive advantage. As per Keynesian economics, demand creates supply, and so demand for sustainability creates its own supply here in the form of innovation and new technologies.

Nike has demonstrated the competitive advantage in innovation through its Flyknit line footwear, which reduces production waste by 80% relative to regular footwear. Due to a specialised yarn system, the Flyknit technology requires minimal labour and has generated large profit margins for the company, while reducing the company's waste by 1.5 billion kilograms since 2012.¹⁸ Tesla's success story is another example of these opportunities, having successfully commercialised electric vehicles in its mission to "accelerate the world's transition to sustainable energy".¹⁹ In 2020 automotive sales and leasing represented the company's greatest source of revenue, which was a whopping \$32bn USD.²⁰

The Honest Case for Sustainability in Business

Sustainability in business can benefit everyone, but only when it is genuine. Some firms adopt the language and appearances of sustainability without any making tangible impact, purely to reap the associated reputational benefits. After all, there is no official, universal definition of sustainability and there are many different ways to report ESG information.²¹ Perhaps, if the role of business is to create shared value, it is the role of government to provide the frameworks to do so transparently. And perhaps it is the role of the rest of us to hold them both accountable.

Lawrence Huynh

Breaking boundaries: the economic challenges of landlocked countries



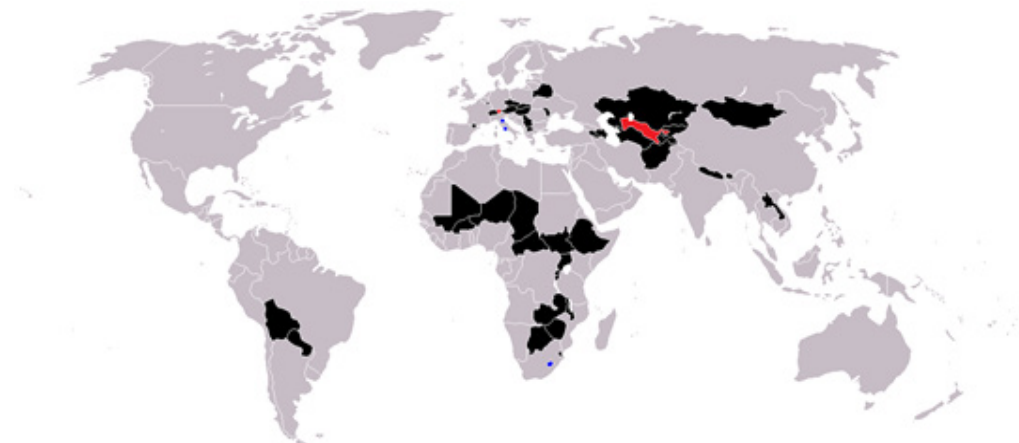
Despite there being 193 officially recognised sovereign states by the United Nations, an empirical estimate shows that there are at least 232 countries, territories, or regions that hold some degree of self-governance¹. There remains no universal agreement on such a number, as political, geographical, and economic phenomena have made this figure difficult to quantify in recent human history. Indeed, cross-border tension, cultural aggression, and military destruction have been the primary barrier for such clarity.

There are 44 landlocked countries and 5 partially recognised landlocked states as of 2021, each of which having emerged from some remnant of war, economic conflict, or diplomatic volition. These sovereign states are entirely enclosed by land and do not have territory connected to an ocean, or whose coastlines only lie on endorheic basins, such as lakes.

The lack of access to the sea presents many economic constraints. Some states may view landlockedness as a liberated blessing of autonomy, while others may see it as a claustrophobic disposition of austerity.

Indeed, of the 44 to 49 sovereign bodies in the world, 30 are exclusively categorised as Landlocked Developing Countries, or LLDCs².

What then makes Switzerland so vastly different to Moldova, Kazakhstan to Kyrgyzstan, or Botswana to Burundi? From politics to geography, let us embark on a global expedition into the world of landlocked countries, and the socioeconomic considerations that have helped shape the potential for growth and prosperity of a landlocked state.



44 countries and 5 partially recognised states are landlocked, spread across South America, Africa, Europe, and Asia (Source: WikiCommons)

The challenges for landlocked countries

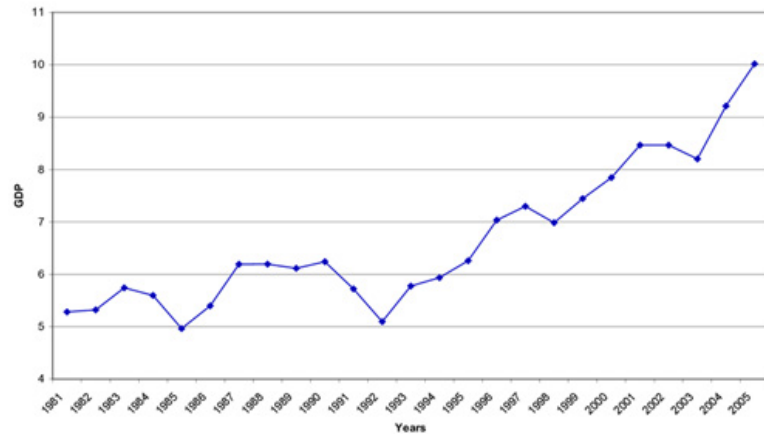
Landlocked countries are predominantly formed through purely geopolitical circumstances. In general, being surrounded by land proves a formidable enemy to a nation’s financial prosperity. Lack of access to the sea significantly reduces a nation’s capacity to participate in maritime trade and production, which increases the costs linked to international cargo transportation, trade tariff payments, and supply chain management. Attempts to conduct trade with the world beyond neighbouring countries can be difficult; even more so if political ties with one’s neighbours are strained, unpredictable or just plain hostile. Whilst a country like Australia has direct commercial pathways to other maritime trading partners via various cities around the nation’s coastline, landlocked regions are not usually so lucky. For instance, a state like San Marino must transit en route through Italy to reach the Adriatic Sea, which it enjoys a healthy diplomatic relationship with. On the other hand, Bolivia must go through Chile or Peru to reach the Pacific Ocean, and those relations have been strained, at best, ever since border disputes in the early 19th Century.

‘If you are coastal, you serve the world; if you are landlocked, you serve your neighbours’, wrote Sir Paul Collier, British developmental economist, in his 2007 book *The Bottom Billion*, which studied the rationale behind the recurrent failure of countries below the poverty line to develop their economy despite the abundance of foreign aid. Sir Collier provides an astoundingly pragmatic diagnosis of why such countries, including the majority of LLDCs, remain in poverty, in which they tend to suffer from at least one of the following circumstances:

1. A conflict trap

Significant or recurrent turmoil due to civil war can be a cause for landlockedness in recent decades. For instance, Ethiopia was the historical keeper of the land adjacent to the Red Sea, off the coast of the Horn of Africa. Eritrea, which now occupies this region as a standalone nation, was a former Italian colony, until it was annexed to Ethiopian rule after World War II. Then, following the 1960s, Eritrea called for liberation from Ethiopia, ensuing a war spanning 30 years between Eritrean independence fighters and Ethiopian military forces. By 1993, a referendum ended with a 99.79% majority vote for Eritrean independence, which subsequently concluded the war and resulted in Eritrea becoming its own country³. Ethiopia became a landlocked nation, and despite a struggle to spur economic growth due to the war, the nation has been blessed with economic growth and reform thanks to a shift from agrarian traditions to heavy industrial investment, making it one of fastest-growing countries in Eastern Africa.

Ethiopia: GDP (in constant dollars over time)



Ethiopia has experienced economic growth and reform after decades of civil war and famine (Source: Dawit Alemu)

Of course, civil war does not exclusively create landlocked countries, as the causes and effects of civil war are largely indifferent in terms of geography. However, civil wars or shaky politics have historically formed landlocked regions, such as South Sudan in 2011 following recurrent conflict with Sudan, or the dissolution of Yugoslavia in the 1990s, which gave rise to countries such as Serbia and North Macedonia.

Although civil war and conflict spares no victims regardless of whether a country is landlocked or not, what makes Collier’s point particularly striking for countries that are landlocked is just how much more difficult it is for them to overcome conflicts than countries that are not. Foreign aid and trade relationships are much more easily addressed by open nations, which puts landlocked countries under significant pressure to not only resolve their conflict, but find a way out that respers growth.



Kilindini Harbour, the main port of Mombasa in Kenya, acts a fundamental maritime trade conduit for landlocked countries such as Uganda, South Sudan, Rwanda, and Burundi (Source: Flickr)

2. A natural resource trap

Countries that are well endowed with natural resources suffer stagnation in economic growth, creating a paradoxical resource dilemma. Collier argues that resources will inevitably be exploited and contested by internal or external players. For instance, the competitiveness of a country's industry exports will reduce due to currency appreciation, or capital-labour inputs of a country's resources become over-saturated, which increases exposure to international commodity price risk⁴. However, this has seemingly not been a challenge for landlocked nations. Botswana, for instance, one of the largest diamond producers since the 1970s, has avoided the resource trap due to effective economic policy, such as their three-pronged approach to economic diversification, revenue allocation away from global markets and good governance and investments, with a focus on generational wealth⁵.



The diamond industry contributes over 50% of Botswana's revenue, bringing an average of 5% growth per annum, making it one of the fastest-growing economies in Africa (Source: MedAfrica)

In similar fashion to the conflict trap, a struggle with the management of natural resources is not exclusive to landlocked countries, but it does exacerbate further inherent problems in the nation. A failure to smartly invest into efficient allocation and enactment of policies surrounding resources points to a failure in governance. The landlocked nation of Uganda is the latest victim of this; having thrown copious investments into its oil and gas industries since 2008, the country's overreliance on this venture put it at high price risk exposures to oil and gas prices⁶. So, with oil and gas prices having fallen dramatically over the past decade, Uganda's economy has slipped backwards, despite its noble attempts to improve its development.

3. Landlockedness with bad neighbours

As briefly touched on, landlockedness can either be a blessing or curse, depending on whether or not one's surrounding nations have good or ill intent, or are well-off themselves.

In 2020, Armenia and Azerbaijan, two landlocked nations in Western Asia, fought a month-long war over the de facto region of Nagorno-Karabakh, and parts of surrounding regions such as the breakaway state of Artsakh. After the city of Shusha was captured in November, a ceasefire agreement was arranged between the Armenian prime minister and the presidents of Azerbaijan and Russian Federation, putting to rest yet another military dispute in the last 30 years between the two nations.

Armenia's military losses in the conflict are estimated to be \$716 million, and the total military expenditure in the month alone has costed over 77% of the country's entire expenditure in the last decade⁷. Both Armenia and Azerbaijan suffered casualties in the low thousands as a collective, and the idea of economic integration looks to be slipping further away. Furthermore, with both countries being LLDCs themselves, Nagorno-Karabakh faces stunted growth, despite experiencing a sustained economic growth rate of 10% over the past decade.

Caught in the crossfire, Nagorno-Karabakh and its conflicting neighbours have all gone through a snap regional humanitarian crisis and experienced great economic and human losses. Furthermore, as a double landlocked state, or a state that is landlocked only by landlocked states itself, Nagorno-Karabakh's economy remains limited, and being surrounded by another pair of landlocked countries presents a greater geographical and political challenge. The relationship of these regions remains in contentious debate today.



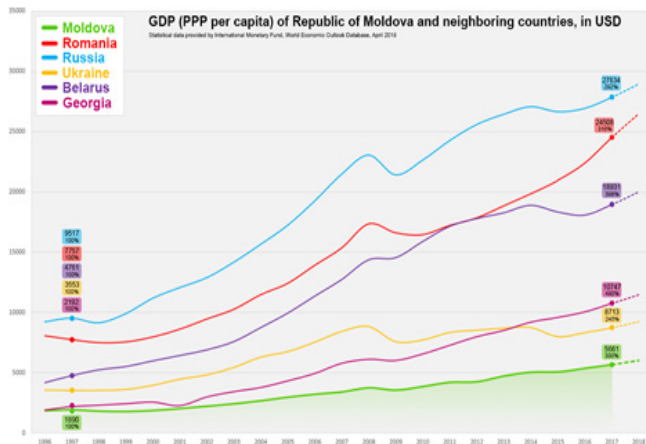
Armenia and Azerbaijan partook in an intense month of war over the disputed Nagorno-Karabakh Republic (Source: The New Humanitarian)

4. Bad governance in a small country

Poor sovereign authority can also quickly debilitate the economic growth potential of a nation through ineffective policies or weak market infrastructure. For instance, the Eastern European nation of Moldova has been an independent country ever since the disintegration of the Soviet Union in 1991. The former Soviet republic was highly dependent on trade and materials via the USSR, and its failure saw an aggravating rise in internal conflict and drought of resources.

Despite seeing some economic reform since, Moldova remains one of the poorest countries in Europe, as well one of the unhappiest on the World Happiness Index in the continent. With an employment rate of just under 40%⁸, it is well below the EU average of 72%⁹, and Moldova has become a polarised society with various productivity and skill inequality challenges, despite being one of the steadiest growing countries in the continent. Moldovan citizens have cited corruption as a major problem in Moldova, followed by unemployment and low income, in a newly released report from the International Republican Institute¹⁰.

Regardless, economic optimism has increased in recent years due to political changes in government and prioritising a reduction in poverty and trading relations with its neighbours Ukraine, Romania, Russia, and several countries in the European Union.



Despite economic and political reforms, Moldova still lags its European neighbours to a significant degree (Source: WikiCommons)

Closing the gap: the successes of Switzerland

So far, we have built an informed perceptual foundation for the economic and geopolitical obstacles that landlocked countries generally face.

What then makes countries like Switzerland or Austria so economically sound, whilst so many of their landlocked counterparts experience such unstable conditions?

As the contemporary saying goes, *'you are who you associate with'*. It comes as no surprise that Switzerland happens to be surrounded by and enjoys a diplomatic relationship

with economic powerhouses like Germany, France, Italy, Liechtenstein, and Austria itself. Despite having little in terms of natural resources, Switzerland makes up for it by having a world-leading banking and finance system, as well as a profound, political stability due to a historically neutral stance during wartime¹¹. This has helped them avoid the damages that so many of its neighbours have experienced in both past and present.

The economic divergence is also attributed to pure geographic fortune, since Western Europe has a mixture of temperate climates, bringing milder winters, more rainfall and better crop production. Furthermore, the region holds far more natural water networks such as rivers and canals, which furthers the potential for interregional trade, productive farming practices and electricity generation.

Compared to its Western neighbours, Eastern Europe is far more reliant on livestock trade and agrarianism, and has not benefited as much from colonisation and the Industrial Revolution. The climate is arid to semi-arid, and the region contains vastly more steppe regions, deserts, forests, and grasslands.

The same can be said for Kazakhstan, the richest country in Central Asia. Despite also being a former Soviet Republic, its sustained diplomatic ties with Russia, China and Eastern European countries have kept its macroeconomic position very strong since its independence. Furthermore, Kazakhstan has used its transcontinental nature to its advantage, utilising its abundance of resources and geographical convenience to form trade and foreign direct investment agreements with various nations across Eurasia.



Switzerland enjoys a temperate climate, resilient trading partnerships, and a congenial landscape (Source: Unsplash)



Kazakhstan enjoys many of the best geographical qualities of Europe and Asia, and its economy has reflected just as well (Source: Lonely Planet)

How can countries like Belarus or Serbia ever aspire to reach the economic power of Switzerland or Austria? How can countries like Nepal mirror the same level of growth as Laos in the past decade? How can Niger follow in the economic footsteps of Botswana?

While neither 'luck of the draw' or 'location, location, location' are far from the truth, opportunities for growth remain for landlocked nations that confront political and economic misfortune. Here's just a few that have been proposed by UN policy analysts, international ministries, and researchers alike:

- Reducing process time and fees in cross-border trade and transportation through more effective trade partnerships
- Improving road and rail infrastructure connecting in and out of landlocked states and territories
- Establishing technical, financial, and political agreements and accords with both neighbouring and foreign nations
- Extending advocacy for peace by absolving geopolitical tensions between regions, establishing reciprocal diplomatic relationships, and hedging mutual risks¹²

The significance of the latest policies to assist LLDCs has been pivotal to their progress. For instance, the Vienna Programme that was adopted in 2014 under the wing of the UN is specifically designed to prioritise the addressal of transit issues of trade, infrastructure for transport and resources, and various methodologies of trade integration. Whilst progress has been slow according to a report from the Economic Commission for Africa in 2020, a deadline set for 2024 and continuous recommendations by the Commission has been paramount to sustaining the conversation.

It's a hope and belief that if some landlocked countries in Eastern Europe or Asia can achieve economic veneration, then other landlocked countries and partially recognised regions can do just the same in the next several years. In doing so, an era of unprecedented geopolitical stability is not only feasible, but will influence a congruous society that knows little of borders, but of economic prosperity and exuberance on an international scale.



Mongolia, the second-largest landlocked country in the world, became the seventh member of the Asia-Pacific Trade Agreement in September 2020, and is the first regional trade agreement for the nation in efforts to reduce trade tariffs with other developing countries and improve regional integration (Source: South China Morning Post)



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A global shift: how governments are embracing Keynesianism in the COVID-19 pandemic

The COVID-19 pandemic has brought about a significant shift in how national governments deal with major economic crises. In the midst of this prolonged global downturn, policymakers in the West have embraced Keynesian economics, and pursued aggressive fiscal stimulus programs in order to re-invigorate their economies. This marks a stark contrast with the response to the Global Financial Crisis of 2007-2008, which saw a return to the disastrous policies of austerity. Now, in 2021, it seems that policymakers have understood the failings of post-GFC economic policy, and now view Keynesian deficit-spending as the key to recovery.

To better understand this broader shift in economic thought, consider the age-old debate on targeting versus universalism. Targeting, of course, is a term used to describe fiscal programs that are designed to support very specific demographics, typically low income earners¹. Conversely, universalism proposes that spending programs should be expansive, providing support to as many people as possible during an economic downturn². For the last four decades, policymakers have favoured targeting, arguing that deficit-spending, whilst initially beneficial, would pose long-term risks in racking up excessive levels of national debt. By contrast, Keynesian economists rejected this fear-mongering over debt accumulation. Instead, they advocated for government to play a greater role in the economy by running large budget deficits in order to stimulate aggregate demand³. In practice, this meant bolstering the welfare state and making greater social investments in housing and infrastructure.

In assessing the economic response to the COVID-19 pandemic, it is clear that national governments have favoured universalism over targeting. Almost every major developed country has pursued larger fiscal stimulus packages, as opposed to limited measures that only address specific areas of the economy. In the United States, for example, the Biden administration worked with Congress to pass the American Rescue Plan (ARP) Act in March of this year, a stimulus package that totalled over \$1.9 trillion⁴. Among its key provisions were \$1,400 direct cash payments, which provided relief to 163.5 million Americans, according to state-by-state data⁵. Here, in Australia, the federal government unveiled the \$90 billion JobKeeper program, which provided a \$1,500 fortnightly wage subsidy to firms per el-

igible employee⁶. All full-time, part-time and long-term casual workers were able to access the payment for a period of 6 months provided their firm met a turnover test⁷. The results of this program were commendable, with unemployment peaking below forecast, and support provided to nearly 30% of the labour force. Such schemes were not isolated to Australia, but were also implemented across much of Europe, New Zealand, and even Russia.

Looking at recent history can provide an explanation as to why larger fiscal interventions were favoured by national governments during the COVID-19 pandemic. During the Global Financial Crisis (GFC), policymakers still largely operated under the neoliberal consensus, and consequently, pursued smaller, more targeted stimulus packages⁸. Whilst these interventions were certainly necessary in dealing with immediate economic concerns, they were ineffective in providing long-term stimulus. Consider the Obama administration's response to the GFC; the American Recovery and Reinvestment Act (ARRA). Totalling \$796 billion, the ARRA was widely considered an inadequate attempt at mitigating the economic trauma of 2009⁹.

The problems with the ARRA were threefold. Firstly, the stimulus package was simply not large enough to tackle the many and varied economic concerns associated with the GFC. A sizeable \$288 billion was devoted to tax incentives for individuals and companies¹⁰. However, the spending on infrastructure and aid for low-income workers and the unemployed — which tends to produce long-term economic benefits — was woefully inadequate¹¹. Secondly, many of the provisions intended to provide stimulus failed to boost consumer spending. The one-time payroll tax credit of \$400, a headline feature of the package, was hugely ineffective as consumers opted for reducing their personal debt, rather than household spending¹². Finally, the ARRA shied away from making permanent structural changes to the US economy. The enhanced unemployment benefits and many of the business tax incentives included in the package were temporary and allowed to expire before the end of 2009, despite the economic effects of the GFC extending well into 2010 and beyond¹³. In this way, the ARRA provided a relatively generous injection of short-term stimulus, but did little to support the economy in the following years.

The obvious shortcomings of the ARRA are demonstrative of the fact that larger, more aggressive fiscal interventions are preferable in dealing with economic crises. A targeted fiscal intervention, which is often subject to tight budgetary constraints, will necessarily neglect certain areas of the economy experiencing economic distress. By contrast, a universalist approach to fiscal intervention — which is not subject to such rigorous constraints — is capable of producing economically and socially desirable outcomes that may not otherwise have been achieved. Consider again the Biden administration's stimulus package passed earlier this year, the American Rescue Plan.

At a cost of \$1.9 trillion, the American Rescue Plan was of sufficient scale to deal with the economic concerns brought about by the pandemic. In terms of providing stimulus, the ARP included a number of provisions designed to boost consumer spending. The enhanced unemployment benefits, for example, were particularly effective. Those receiving unemployment insurance tend to have a higher marginal propensity to consume, meaning that most of the \$300 weekly supplement was being injected back into the economy, as opposed to being put into savings¹⁴. Beyond providing stimulus to the economy, the ARP also produced several socially beneficial outcomes. The expansion of the child tax credit, for example, was one such measure that had a tangible social impact. In combination with the \$1,400 stimulus checks, the expansion of the child tax credit to \$3,000 helped cut child poverty in the United States by 57.8% and reduce overall poverty by a third¹⁵. Furthermore, the \$21.6 billion worth of rental assistance was credited with staving off the worst effects of an eviction crisis in the first half of 2021.

In this way, the American Rescue Plan represents a more effective attempt at dealing with an economic crisis, particularly given the efforts of the Obama administration in 2009. Whilst the bulk of the ARRA constituted individual and corporate tax incentives, the ARP focused on providing support to those most impacted by the pandemic, low-income earners and the unemployed. Significant spending on food stamp benefits, rental assistance and emergency paid leave overwhelmingly benefitted these two demographics¹⁶. Indeed, the combination of the direct cash payments and child tax credit expansion was estimated to have increased the incomes of the poorest one-fifth of Americans by \$3,590¹⁷. The ARRA was far less generous. Direct cash payments were limited to \$250, and less than \$4 billion was allocated towards rental assistance¹⁸. The ARRA included no provisions relating to paid sick or parental leave, and unemployment insurance was increased by just \$25 a week. This more targeted approach meant that the ARRA produced a smaller stimulative effect on the US economy.

Should the American Rescue Plan prove to be an effective stimulus program in the long-term, it would likely spell the death of neoliberalism in the United States. Indeed, should this global embrace of Keynesianism ensure a path to eco-

nomical recovery, it would likely bring an end to the neo-liberal consensus on an international scale. Many of these stimulus packages, like the American Rescue Plan, have already produced greater economic benefits than their GFC counterparts. Here, in Australia, nine out of every ten jobs lost during the pandemic have been recovered, thanks in large part to the federal government's JobKeeper scheme¹⁹. National governments have recognised that a more universalist approach to fiscal intervention is better; not only in terms of the broader macroeconomy, but also in delivering preferred social outcomes. Only time will tell if this change is here to stay.

Felix Plunkett

The exploitation of Australia in the South Pacific

In 2014, the actions of an Australian investment bank, foreign politicians and the owner of one of the world's wealthiest football clubs showcased the epitome of detrimental Australian influence in our most dependent region.

An ongoing Royal Commission in Papua New Guinea (PNG) is currently uncovering the details of a \$1.2-1.4bn dollar loan from the Australian branch of one of the world's largest investment banks, UBS. A US derivatives expert, Dr George Oldfield, recently told the hearing that UBS Australia intentionally misled the PNG government by claiming the deal was 'nil premium', or of no immediate value to UBS shareholders [1].

For nations like PNG, with GDP per capita comparable to countries in sub-Saharan Africa, nil-premium loans are vital for development due to their low economic cost. However, while such loans may be commonplace from the World Bank, such arrangements are less common from investment banks. Oldfield claims the 'overly complex' deal was worth at least A\$25 million to UBS, a profit 'not disclose[d]'. The effects of what was at least equivocation, and at worst, blatant corruption, has had resounding impacts on the political and economic stability of our closest neighbour [5].

Despite PNG not being a wealthy nation, UBS still claimed the loan had no credit risk. In other words, UBS claimed it was not necessary to charge high interest rates to compensate for the risk of default. PNG is a sovereign nation, which, compared to private firms, are unlikely to declare bankruptcy. Therefore, such an assessment was quite reasonable when coupled with PNG's adequate credit rating. Yet, the complex set of interest obligations that ranged from 5.34% to 12.0%, compound the notion that the bank acted more as predator than a generous facilitator [2].

To make such a fair risk assessment, and to then charge interest rates comparable to contemporary credit cards is an obscene contradiction.

UBS has faced further criticism as it acted on both the sell and buy side of the deal as lender and advisor [5]. While such a scenario may appear untenable, it is not uncommon as banks are bound by a 'Chinese Wall' where buy and sell-side departments of a firm are legally barred from communicating with one another to prevent conflicts of interest.

Are such accusations of foul-play valid? It's hard to know. As the Royal Commission is being held in PNG, UBS Australia is under no legal obligation (domestically) to hand over documents requested abroad. Dr James Renwick (counsel as-

sisting PNG on the Royal Commission), who has previously worked on cases such as the Coronial inquest into the Lindt Café Siege, has spoken with fervour to the detrimental effect the case is having on the reputation of UBS Australia [3]

The purpose of this loan was to allow PNG to take a 10.1% stake in the ASX listed Oil Search [4], one of the largest companies with significant assets held in PNG.

At the time, there were rumours that Sheikh Mansour, a member of the UAE royal family, was interested in a takeover bid of Oil Search through his state-owned company International Petroleum Investment Company (IPIC).

How credible were such rumours? When Oil Search's acting treasury secretary went to Abu Dhabi to visit the billionaire, he was snubbed so that Mansour could watch his Manchester City football team play in the UK [5].

The intentions of IPIC remain opaque at best. The same can be said of then PNG Prime minister Peter O'Neil. Perhaps O'Neil's intentions were to cash in on a lucrative takeover from the Middle East. Perhaps he was acting in the interests of national security and employment by securing significant voting rights in Oil Search. Was there a fear of losing support from a company that had pledged millions of dollars from economic development? Was there a degree of corruption involved? The ongoing Royal Commission seeks to find out [5].

What is known is that within two weeks O'Neil rushed approval of a loan worth 5% of his nation's total GDP. He fired, and then self-replaced, his own national treasurer via text message after he was told the deal 'might destroy PNG's economy' [5].

The loan will almost certainly be proved to be unconstitutional, all for a cause, Dr Renwick claims, gave PNG 'no strategic advantage'. Not only was the deal inappropriately large for such an underdeveloped country, but the deal was essentially a bet on the price of oil without a mechanism put in place to minimise prospective losses (unhedged). The risks were monumental.

Within 6 months oil prices halved, the value of Oil Search fell heavily, and PNG was forced to sell stock to an ever opportunistic UBS for losses approaching A\$600 million.

These losses were so bad that the PNG government contemplated making defaults on loans from the World Bank. It too almost caused a run on the national currency, which

occurs when demand for local currency plummets, causing import costs to surge.

Oil Search's 2013 (a year before the loan deal) annual report sees then Managing Director Botton make a telling remark after IPIC bought call options from the government to become Oil Search's largest investor:

“ownership of the PNG government’s 196.6 million shares, held since 2002 transferred to IPIC... the interests of Oil Search and the Government will remain. The Government’s new investment demonstrates their confidence in the Company (Oil Search)... We also welcome IPIC onto our register as our largest shareholder” [12].

Markets are often studied with an assumption of rational decision making. The decision making of O’Neil was devoid of sensible economic reasoning. When a nation wilfully loses control in one of its most important private firms, it appears the limits of one’s capacity for rationality can be pushed beyond its’ limits.

While the intangible relationship between Oil Search and PNG may have changed little, there was undoubtedly a major powershift in a company that then had a market capitalisation over 10% of PNG’s total GDP. While there are consequential risks associated with losing voting rights to a foreign third party, the evidence suggests they were insufficient cause for O’Neil to take such personal and irresponsible financial control.

What cost PNG over half a billion also cost O’Neil his job. A man often criticised for his Sydney harbour mansion and history of private investing, was pressured to resign and was replaced by his former minister for finance, James Marape [5].

And what of Oil Search? Botton recently stood down as CEO and was replaced by Dr Kieran Wulff. Within 18 months Wulff stood down due to poor health, yet recent allegations have alleged that he was forced to step down due to internal pressures resulting from “unacceptable behaviour”. What this behaviour allegedly entailed is yet to surface [15].

Despite the fickle will of a football tycoon, Oil Search did get their major takeover. A merger with another PNG focused oil company, Santos, will see the new company overtake Woodside as the ASX’s most valuable oil producer.¹ As the two firms squabbled over the last 1.5% of valuation, Prime Minister James Marape tried to enforce a veto to protect jobs in PNG, a desperate task for a country with an economy half the size of Canberra, without any stake in either of the companies.

Perhaps the greatest issue for the region is that this saga is not an isolated incident. PNG’s biggest lender, the ASX listed Bank of South Pacific, was found to have seriously breached a number of PNG laws relating to counter terrorism and money laundering [7].

Australia’s public sector has also behaved shamefully. The national intelligence body (ASIO) was found to have bugged and spied upon leading officials from Timor-Leste (TL) in the early 2000s. This resulted in Australia successfully gaining a significant advantage in claiming known oil fields just south of the TL coast [8]. What may well have begun with gluttonous mining of phosphate in Nauru generations ago [9], appears to have no end in sight.

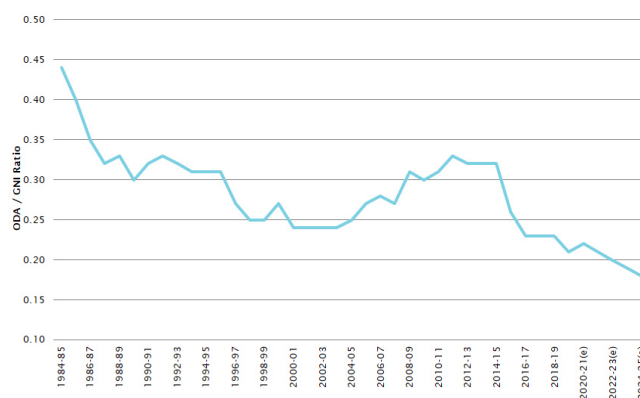
Instead of being fair, Australia has been opportunistic. Substantial wealth could be extracted by increasing taxes for some of the world’s wealthiest, highest polluting corporations. Instead, we have coveted our vulnerable neighbours and gouged on their rightful fortune [11].

The contemporary economy should be a mechanism where all have a right to prosperity. If our government isn’t expected to play fair in the Pacific, then the actions of our private firms are perhaps less surprising.

We may believe we are the nation of giving everyone a ‘fair go’. Yet when push comes to shove, it is not our impoverished neighbours, but rather, our wealthiest private firms that are deemed worthy of economic opportunity. While our contributions of foreign aid (which predominantly does go into the Pacific) must certainly not go unmentioned, the aid given as a proportion of gross national income has been in decline for decades, a trend our own government admits will continue. At only 0.74% of the 2021-2022 federal budget we are miles behind other countries in the OECD [10].

Put simply, Australia is not generous, we are quantifiably self-serving.

Foreign aid as a proportion of gross national income



Commonwealth Parliament; Parliament House, C ‘2021–22 foreign aid budget’, accessed September 5, 2021, from <https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/BudgetReview202122/ForeignAidBudget>.

Joel Lee

Making a megapolis

Rome wasn't built in a day, but rather upwards of two thousand years. For the past few decades, we've become obsessed with working slightly faster - Joel Lee explores the emergent trend of scratch-built cities.

Cities are supposed to be venerable old things, with ages far beyond the human frame of reference. The notion of constructing a city completely from scratch therefore dissonates somewhat with the mind. Many might find it surprising that the past forty years or so has seen an explosion of scratch-built cities, with around 150 currently in some stage of development¹.

More city space is needed than ever. As developing countries undergo economic transformation, urban migration becomes more of an important issue for governments. Around 55% of the world's population currently live in cities; in 30 years, that number is expected to rise to 70%². That's certainly a positive way to view this whole trend - as a means of increasing available housing as people are lifted out of poverty.

Overall, the execution of these projects has seen varying success. While some cities grow into impressive communities, others fail spectacularly, never evolving beyond mountains of concrete. The images of such failures are strikingly surreal - eerily idle city squares and hollow husks of unused housing lots.

So, what sets these cities on the path to failure or success? And why are we so obsessed with these colossal projects, where a positive outcome is far from guaranteed?

To sell a city

Convincing powerful people to spend hundreds of billions on your city design is as good as time as any to unleash every sales trick in the book. Perusing the names of cities under construction would suggest that governments aren't interested if your city isn't 'eco', 'smart', or at the very least '-of the future'.

Diverse literature exists examining the agents who craft these city-sized concepts, and the seductive way they pitch them to the world's nations. Global though this frenzy may be, it is the plans of a few elite architectural-engineering firms concentrated in North America and Europe from which the majority of new cities emerge. This handful of entities, dubbed the 'Global Intelligence Corps', have accumulated a level of status such that they can exclusively bid for whatever prestigious projects may exist³.

Competition between GIC firms is fierce - and a plethora of marketing techniques are employed in order to craft as enticing an offer as possible. Holistically, these techniques form a prospective city's branding, tailored to whatever urban concept is en vogue⁴. A few decades ago, that seemed to be a city that was pro-growth and provided an ideal business climate⁵. These days, it's all about smart tech-integration and eco-friendly, sustainable urbanism. Glossy digital renderings, fancy scale models, and exclusive stakeholder conferences⁶ then combine to push a captivating narrative of sustainability and progress, often independent of feasibility⁷.

Things seem to change once the deal is done. Examples abound where the practical reality of city construction requires, most unfortunately, a reduced focus on sustainability targets⁸. Given that there is a housing crisis, it does follow that the houses are very important. But regardless of one's stance on environmentalism, there's an inescapable irony about building an eco-city of the future upon acres of wetland.

A spectrum of success

In spite of the disparity between rhetoric and reality, many of these cities do end up being developed. How do success and failure manifest themselves in these urban environments? The great number of city projects, either finished or still in development, provide a variety of fascinating answers.

Economic growth boosters

For developing countries, a steady stream of foreign capital inflows is essential for economic development. One successful way of attracting such investment has been the creation of special economic zones (SEZs). These areas are designated to have different commercial laws which more conducive to free trade, innovation, and allocative efficiency⁹.

In recent times, SEZs have been effective at spurring economic growth. China's SEZs, although responsible for the severe trend of coastal-inland inequality¹⁰, were crucial in the nation's economic development. Since gaining SEZ status in the 1980s, cities like Shenzhen and Guangzhou have grown from fishing towns to sprawling metropolises¹¹. Similarly, India has implemented many regional SEZs with a

focus on export competitiveness. Investment and employment in these areas has grown much more impressively than the nation's average¹².

On the other hand, sometimes it falls flat. Malaysia's Cyberjaya, emerging in the mid-1990s, was promised the ultimate *intelligent city*, and to *lead the nation into the information age*. What was promised as a *campus of information-era businesses* and a *global knowledge economy hub* eventuated into a cluster of call and data centres¹³, all while lacking social amenities¹⁴. Commentators have suggested Cyberjaya is a case where the totality of promised benefits were either exaggerated, if not imaginary¹⁵.

Societies of circumstance

High-tech housing, economic incentivisation, sustainable development- all worthless to a city with no-one to live in it. Hitting population targets seems to be the downfall of the cities which fail and a stumbling block for cities that succeed¹⁶. After all, you can use maths to optimise an urban sprawl, but to sell people a new life? Not so much. The communities that do form are ... not necessarily faulty, but a bit bizarre. It turns out there is a difference when a community is formed not organically over time, but by the market.

South Korea's Sejong Special Autonomous City, opened in 2012, is a one instance of this. Aware of the challenges of meeting population targets, the city's officials introduced subsidies for mothers who gave birth. In 2018, the city had the highest birth-rates out of any region in South Korea. This isn't because of cleaner air or greener grass, but because newlyweds flocked there to start a family. One-40 year old mother remarks, "It's like everyone is a couple around my age with kids around my son's age. It feels a bit unnatural, somehow¹⁷".

The flipside is also true, and seems less pleasant. Take Songdo, another scratch-built city in South Korea designated as a SEZ. Like Sejong, young couples with children make up a significant slice of the population. "Usually the [community groups] are for moms, or for middle-aged or married men to go golfing or fishing," says one resident. For younger people, it's a bit more of a lonely city, actually," echoes another¹⁸.

Forces of the housing market can clump not only demographics together, but classes. Whether you look at plans for UAE's Masdar City, Nigeria's Eko Atlantic, or Saudi Arabia's KAEC, there's an abundance of country clubs, luxury apartment blocks, and high-end shopping malls¹⁹. Certain planned cities look a lot less like benevolent endeavours to increase available shelter, and more like city-sized playgrounds for the wealthiest among us.

The unknowable future

Scratch-building cities does seem like it will continue persistently into the near future. Yes, the failures are stunning, and the successes are not, but maybe the full benefits of these projects will take many decades to come to fruition. Again, the human timeframe of reference overemphasises its own importance. Perhaps scratch-built cities are destined to be a part of whatever the multifaceted solution to humanity's growing population ends up being. Some of the cities dismissed as failures today might be thriving metropolises a hundred years from now. However, whether you ask scratch-built city residents of Saudi Arabia, South Korea, Malaysia, China, or India, waiting for that is quite lonely. For now, there will remain hundreds of shiny cities and glittering skylines lying dormant, waiting to be lived in.

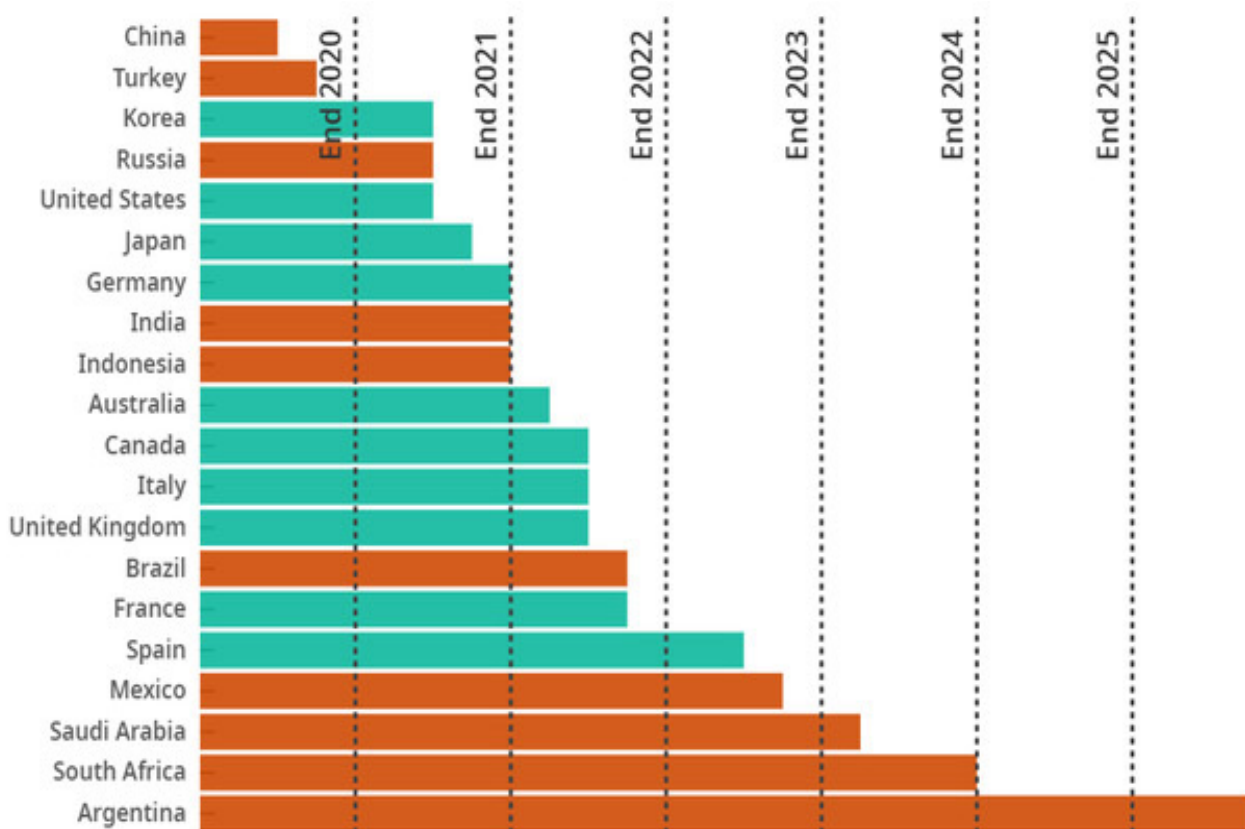
Reintegrating world economies post COVID-19: a case for higher technology diffusion

As the world begins to re-emerge from the health and economic crises brought upon by the pandemic, through mass vaccination campaigns and covid-safe measures, a question has been at the forefront of policymakers' minds: how do we boost and maintain economic growth? [1] So far, countries have been diligently working towards this goal. Despite the positive news that countries are beginning to return to pre-pandemic levels, there are many who are still battling covid outbreaks and may not have the resources to bring their economies out of recession. For example, based on the *Economic Policy Reforms 2021: Going for Growth: Shaping a Vibrant Recovery* report by the OECD, developing countries are at risk of lower economic growth for several

years prior to reaching pre-pandemic levels.

The below figure highlights the disparity amongst countries which would exacerbate the global GDP growth inequality and lead to worse outcomes for individuals subsisting on lower incomes or those hit hardest by the pandemic [2]. For example, developing countries, denoted in orange, show prominent disparity where China and Turkey have already reached pre-pandemic GDP levels versus Argentina with no sign of recovery until late 2025. In fact, we see from this figure that even developed countries, in green, such as France and Spain would take several months to recover to pre-pandemic GDP growth levels.

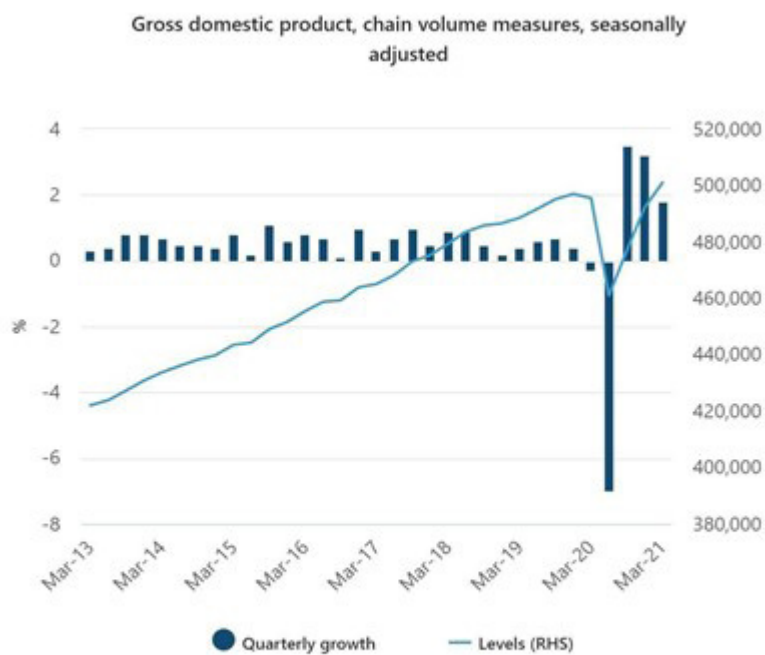
Figure 1: Disparity in recovery times to pre-pandemic GDP growth levels



Recovery to pre-pandemic level: a sustained increase in real GDP per capita above its Q4 2019 level. For countries recovering after Q4 2022, calculations are based on average quarterly growth rates in 2022. • Source: OECD (2021), [OECD Economic Outlook No.109 \(Edition 2021/1\)](#)

Based on this OECD report, Australia has performed well and is on its way to recover by the end of the first quarter of 2022. Though Australia has experienced sharp growth in the nominal GDP from the June 2020 quarter, at the start of the pandemic, it decreases over subsequent quarters with the latest GDP growth measuring at 1.8% as of March 2021¹. Of course, with the current Delta variant outbreak it may keep falling, reinforcing the need for a more resilient economic growth framework to be introduced. Naturally, this is not only a national problem and so it requires a global solution.

Figure 2: Australian GDP growth



Source: Australian Bureau of Statistics, Australian National Accounts: National Income, Expenditure and Product March 2021

We must look towards potential solutions to tackle the challenge of recurring covid outbreaks, disparity in resources between countries and the fragility of supply chains. One solution is working towards inclusive and resilient growth by sharing technology and innovation. To highlight the contribution of innovation, consider a basic economic production model where output relies on three basic inputs: labour, capital and technology². Capital goods require financial investment and a heavy reliance on transportation and supply chains which are at risk in the current, unpredictable environment. Similarly, labour mobility has been severely hampered by covid outbreaks and strict border controls across and within countries. Hence, this emphasises the importance of technology and innovation as the driver of efficiency and output growth for many countries. Also, sharing digital technology via digital channels has become much easier with recent leaps in cloud computing, virtual workplaces and remote computing expertise. Thus, technology diffusion – or sharing – appears to be an attractive solution which grants a higher payoff to countries which are lagging in their economic recovery.

Nevertheless, this raises an objection: Why should innovative firms and nations, which have invested heavily in R&D³, share their coveted knowledge? This is a valid concern and will also be answered later in this article.

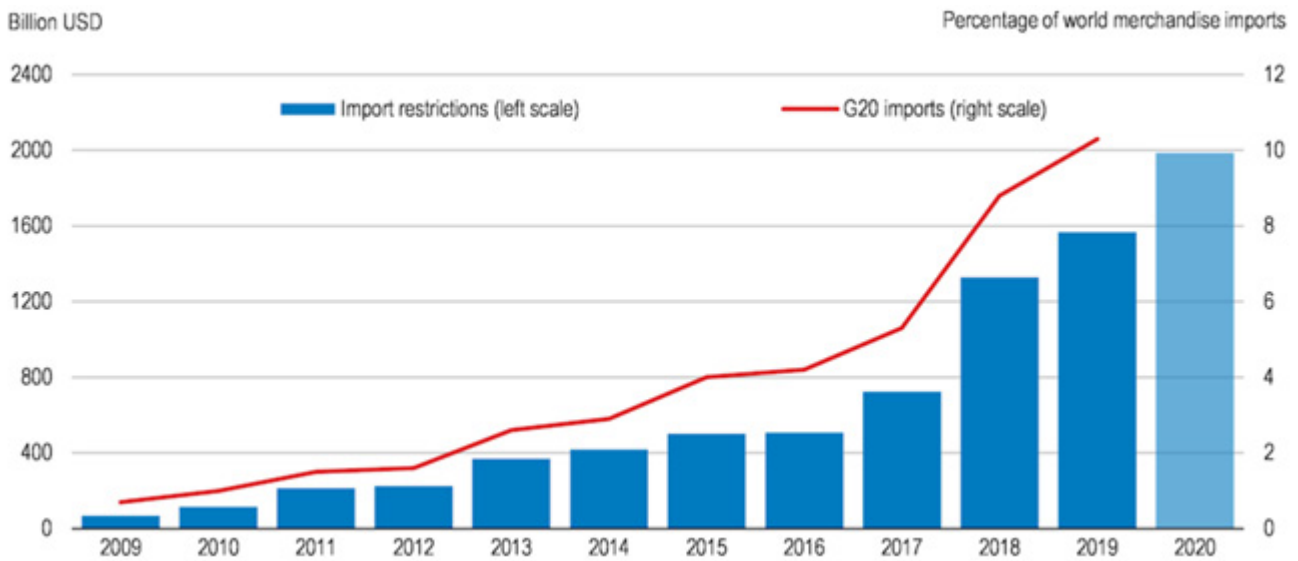
How does technology diffusion occur?

Prior to answering any questions, we need to understand how this diffusion occurs. Firstly, we can define some firms as ‘leaders’, characterised by a strong research base and a high level of innovation. Conversely, there are ‘follower’ firms which improve their level of technology by absorbing the innovation from leaders. The rate of absorption depends on the level of industry cooperation, trade of goods and services and most importantly, the level of aggregate innovation. The last concept is called the ‘technology frontier’ which is the highest level of technological progress available in the industry.

Secondly, in this diffusion process followers may not directly pay or compensate the leaders for expanding the technology frontier. This issue has led to firms and governments enforcing stronger intellectual property (IP) protection laws and – to use a dramatic phrase – jealously guarding their secrets. Some more overt examples include the US lawsuits against China concerning forced diffusion [3].

Thirdly, this model of economic growth through technology feedback from leaders to followers can only lead to sustainable growth if leaders are incentivised to keep innovating and sharing their technology. Unfortunately, this appears to be a diminishing prospect as trade protectionism grows. For example, as evidenced in figure 3, trade restrictions have been increasing well into 2020. Noticeably, there is also a large jump post-2017. This indicates that countries are relying on protectionism and imposing heavier tariffs to reduce the flow of imports from foreign economies. Furthermore, this creates an environment for counter-restrictions and costly global trade activity.

Figure 3: Global level of import restrictions in USD and G20 imports



Source: Economic Policy Reforms 2021: Going for Growth: Shaping a Vibrant Recovery, Accessed: August 19, 2021

The case for promoting technology diffusion

Having considered how diffusion occurs and the obstacles in its way, we now return to answering the original question: Why should technology diffusion be promoted? The concept which motivates this is that imitating technology allows followers to innovate and contribute to overall economic growth through efficient production – matching that of leading firms in the economy. This theory has been supported with an analytical model by Perla and Tonetti in their 2014 paper ‘Equilibrium imitation and growth’ [4].

The main argument the authors present is that in a distribution of firms along a productivity curve, only a few leaders are at the highest percentiles of productivity. Similarly, the firms which are unable to innovate are clustered at the lower region of the distribution. Lower productivity firms may have the physical capital goods or labour required to reach the same level of output but find it too costly to do so with their poorer efficiency of inputs. As a result, the industry output is restricted. The paper claims that followers can take risks and search within the economy for technology which is a positive externality from innovative leaders. Through an iterative process, this search policy allows followers to move upward along the distribution curve. Consequently, the new equilibrium in a resource-constrained economy emerges at a higher output level.

Extending this argument to the global stage, consider the highly productive countries which employ cutting edge technologies. These countries are located at the top of the productivity distribution and are denoted as ‘leaders’. Analogous to the model, we have developing countries without the same R&D base. These ‘follower’ countries are limited to lower output quality and quantity. Applying the same concepts from Perla and Tonetti (2014) we potentially observe the growth in global output. This could lead to higher exports from developing nations, lower cost imports for developed countries and more profitable global value chains [5].

Additionally, bringing developing nations on par in terms of technology and efficiency has a myriad of social benefits. For example, improving living standards in poorer countries and breakthroughs in green technologies.

Conclusion

Though the pandemic has fractured labour mobility, trade flow and international relations, solutions do exist. Technological diffusion can be a strong tool which enables the reintegration of economies and potentially unprecedented growth. To protect and promote R&D, dissemination of technology must be balanced with strong oversight and diplomacy to avoid pre-covid levels of trade restrictions and legal implications of intellectual property breaches. Organisations such as the World Trade Organisation (WTO) and World Economic Forum (WEF) can play an even larger role in promoting international cooperation and diplomacy in this area.

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Henry Xiong

Singapore – a housing policy success story

The insidious issue of housing unaffordability has long been a policy challenge for many developed countries. According to the 2016 census, home ownership rates in Australia have declined to 67.1% - the lowest figure recorded since 1954 (1). A recent survey reported that nearly two-thirds of Australians believe home will not be an option for many young people in the future (2). However, one country appears to be an exception. Singapore – a tiny island nation in Southeast Asia – had a home ownership rate of 87.9% in 2020 (3). How in the world did they accomplish this?

How Singapore’s housing policies work

Stemming from founding Prime Minister Lee Kuan Yew’s philosophy that “every citizen [should have] a stake in the country and its future” (4), Singapore’s housing policies were engineered with one goal in mind – to give every Singaporean the opportunity to own their home outright. The Singapore model relies on a robust system of high quality, low-cost government-developed public housing to keep homes affordable. The combination of legislative support, a highly effective superannuation system and market intervention from the government has enabled Singapore to house a staggering 81% of its population in public housing (5), leading to one of the highest home ownership rates in the world (3).

Singapore’s public housing policies are supported by two key pillars: the Land Acquisition Act 1966 and the Housing Development Board’s (HDB) CPF housing framework. Recognising the importance of inexpensive land in realising a successful public housing program, the Singaporean government legislated the Land Acquisition Act 1966, which granted the state sweeping and near-inviolable powers to compulsorily acquire land for any “residential, commercial or industrial purposes” (3). Moreover, land prices were pegged to the market price at a specific date; for example, 30 November 1973, and kept static for several years before being updated (4). This prevented landowners from capitalising on the nation’s burgeoning real estate prices, which were growing at a real rate of 10% between 1975 and 1990, and enabled the government to cheaply purchase vast areas of land (6)(7). The legislation was so effective that the percentage of state-owned land increased from 49% in 1965 to 90% in 2018 (8). The government’s access to inexpensive land laid the foundations for many of the successful supply-side housing policies implemented by the HDB.

The HDB was founded in 1960 to combat the prevalence of unhygienic slums and squatter settlements in the nation (9). The HDB, assisted by the state’s ability to compulsorily

acquire land from landowners without room for legal recourse, were able to rapidly deploy affordable yet quality apartments to house Singapore’s rapidly growing population. A salient example of the HDB’s efficacy presents itself in the Bukit Ho Swee incident, in which a large fire demolished the eponymous squatter district in 1961 and left 16,000 people homeless. The government immediately ordered 12,000 new flats to be built on the burnt land, and rehoused all 16,000 people by the end of 1964 (6).

Although it began as a rent-only public assistance initiative for low-income families, the HDB’s public housing system soon pivoted to selling apartments to the general public under 99-year leases. Homes could then be traded on the private housing market largely in the manner of private houses (10). To assist families with raising the 20% down payment required to purchase a new HDB flat, the government reinvigorated the Central Provident Fund (CPF); a superannuation system that was established during the country’s days as a British colony (4). Both employee and employer contributions were drastically increased – from 5% by each party in 1955 to 20% by employees and 17% by employers in 2016 – and citizens were allowed to prematurely withdraw from their CPF accounts to purchase property (6). Mortgages were provided by the HDB in lieu of private banks, and the interest rate they charged to homeowners was pegged at 0.1 percentage points above the CPF savings rate. Whilst financial institutions have since been allowed to enter the mortgage market (in 2003), the protections and privileges granted to new homeowners have helped many first home buyers acquire their first piece of real estate.

Despite the effectiveness of the HDB – CPF framework, Singapore’s staggering home ownership rate would not have been possible without the presence of market interventionism and supply and demand-side macroprudential policies. Stringent market controls dictated the purchase and sale of HDB flats, and access to the flats depended heavily on marital status, income, age and nationality (10).

Permanent residents, citizens earning above a certain income, and private housing owners were not permitted to purchase HDB flats before 1989 (6)(10). These rules, along with the limited financing available to purchasers of resale HDB properties, greatly curtailed the nation's property prices – keeping homes affordable. When the market was finally deregulated in the 1990's, the government introduced numerous macroprudential home-purchasing policies to combat housing unaffordability (6), including:

- Increases in stamp duty for both the seller and buyer
- Tenor restriction limit
- Loan-to-value ratio limits
- Mortgage service ratio limits
- Total debt service ratio limits
- Ban on interest-only home loans
- Capital gains tax on the reselling of property within 3 years of purchase

What lessons can Australia learn from Singapore's housing policies?

Singapore's housing policies materialised as a response to the unique socio-economic challenges of its time. It is extremely unfeasible for the Australian parliament to pass legislation tantamount to the Land Acquisition Act today. However, despite the limitations of our political system, there is one major lesson to be learnt – and that is to **be more uncompromising**.

Regulatory measures such as restrictive land-use regulations and restrictive zoning have greatly constrained the housing supply in Australia (11). Legislators regularly cave in to pressure from voters rallying against the construction of medium and high-density town houses, and authorities remain largely unwilling to cool the nation's booming property market at the expense of current home owners (11)(12). Numerous measures have been proposed as solutions to the nation's housing challenges including abolishing negative gearing, allowing for early superannuation withdraws and changing regulations to allow high density housing (13). However, each of these policies would inevitably cause dissatisfaction for a key voting bloc or interest group. Whilst Singapore's approach could be seen as draconian, Australian legislators must display a similar level of political resolve if they wish to truly ameliorate the long-term issues relating to home ownership and housing affordability.

Zexin Yuan

Skill bias, technical change and work from home

Whilst high skilled workers are conducting meetings on their laptops, swaying back and forth gently in their rocking chairs, the rapid use of technology might hit low skilled workers hard by increasing income inequality.

Introduction

Working from home has become more relevant than ever, and is the new norm for some workers, possibly forever (practically). According to ABS surveys conducted from the 12th to 21st February 2021, 41% of workers worked from home at least once a week in that month, compared to 24% back in March 2020.¹ This percentage is expected to increase in the next few months to almost half of the labour force.²

The drastic increase of working from home rates may have enormous consequences for Australians. This article will cover the potential consequences of the increasing rate of working from home by discussing the utilisation of technology and the impacts on income inequality.

Skill bias technical change and work from home

It is of no surprise to anyone that technology aids workers to work from home. For example, communication software that facilitates conferences and meetings are an essential part of working from home, and efficient utilisation of these modern technologies have contributed to the productivity of workers.³ In turn, it is not surprising to see software providers such as Zoom see their revenue skyrocket throughout the whole pandemic.⁴

However, not every worker will get the same slice of the pie from the use of technology. It is necessary to introduce the concept of skill bias technical change to explore the topic further.

Skill bias technical change is a concept which predicts when some new technology is introduced, demand for skilled workers will increase more than the demand for unskilled workers.⁵ The reason being that technology are effectively substitutes for the work of unskilled workers and complements for skilled workers. For example, the introduction of Check-in with QR codes using the Service Victoria app replaces human labour (unskilled workers) who manually records visitors' details on paper. In contrast, the software increases the efficiency of a health officer in delivering faster contact tracing directions due to the saved time of going through handwritten documents. Hence, the demand for unskilled labour will be lower, and the demand for skilled labour will increase.

This concept suggests that newly developed working from home technologies will increase the productivity of skilled

workers and will replace unskilled workers. Unskilled workers such as delivery drivers simply do not benefit from working from home technology because they cannot work from home. In comparison, skilled workers working from home were estimated to have a 13% increase in productivity in one study.⁶

Not only are skilled workers more productive when working from home, they are also becoming more efficient over time. A study estimates that working from home productivity has increased 46 percent relative to the productivity of working in the office since the start of the pandemic.⁷ As skilled workers become better at working from home and utilising technology, technology develops more, leading to a circular effect of skill bias technical change.

Studies have shown that skill bias technical change can diffuse internationally.⁸ When a country experiences skill bias technical change, a nearby country can also experience it. The property can be likened as flu and can contribute to income inequality in other countries, leading to a second circular effect of skill bias technical change.

Income inequality and skill bias technical change

It is possible that working from home technology can widen income inequality as skilled workers get more productive overtime leaving the unskilled workers behind.⁹

Income inequality has already been growing in Australia.¹⁰ Excessive inequality can erode social cohesion and hinder growth.¹¹ However, income inequality in Australia has been mobile. Almost everyone moves across the income distri-

bution throughout their lives.¹² Fortunately, this is a different scenario compared to a stationary level of inequality which only occurs at the ends of the income distribution, being the poorest and the richest. Other countries might not be so fortunate and have to deal with stickier income inequality.

Conclusion

Technology is generally good for society as it increases productivity for everyone. However, its growth and effects on income inequality remain something worth monitoring. Australia should not be too concerned about the negative impact because of its effective policies against income inequality.

For all the tech nerds out there like me, enjoy your Raspberry Pis for now, and I hope you all get a fair slice of income!

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Travis Huynh

How can we unlock the full potential of biotechnology?

The biotechnology industry

Biotechnology (“biotech”) is the application of science and technology to living organisms, for the production of knowledge, goods and services¹. Despite its recent emergence, biotechnology is a promising sector that has already been responsible for developments ranging from COVID-19 vaccines to biofuels. Future advancements, however, require innovative policy options tailored to the unique nature of the industry.

The biotech industry only started to emerge in the 1980s. Figure 1 shows the number of mentions “biotechnology” received in a database of books published in English². The sharp increase in the 1980s was likely when biotechnology and its applications were first widely known publicly.

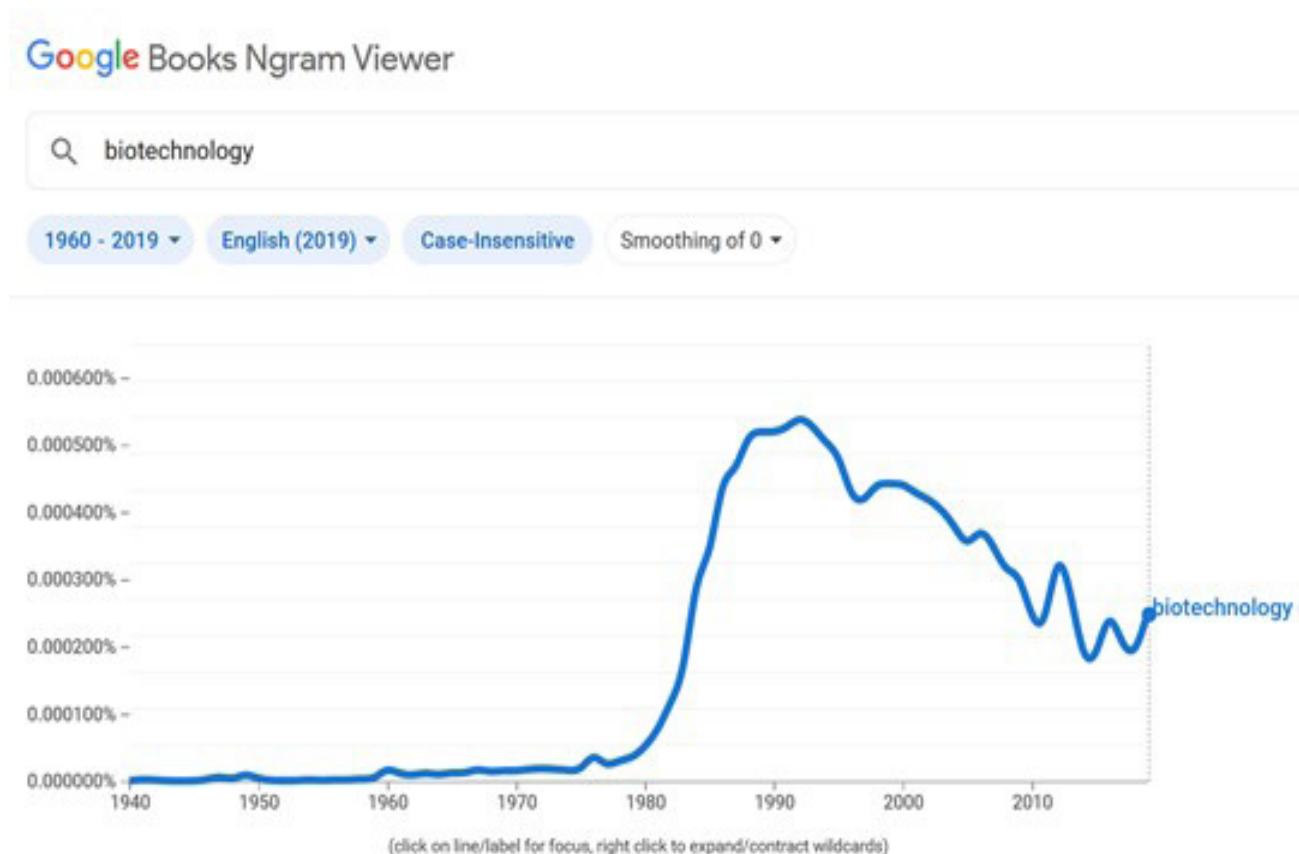


Figure 1: Mentions of “biotechnology” in a database of books published in English

There are few large biotech firms in Australia. Most firms are currently smaller organisations without a product on the market. IBISWorld estimates that 540 businesses are currently operating in the Australian biotech space³. As of August 2021, only 42 of these were listed on the ASX⁴.

Biotechnology is a broad sector which intertwines with other industries. CSL is by far the largest and most well-known Australian biotech firm. Starting off as a government-run organisation in 1916 for the production of vaccines, it now owns a 12.4% share of the Australian biotech industry⁵.

The biotech industry is usually compared to the pharmaceutical industry. Despite some similarities in their operation and distribution, they have different risk factors. Biotech firms focus on generating products derived from living organisms, while pharmaceutical firms develop their products through chemical synthesis⁶.

Globally, the US owns about half of the global value of biotechnology (in 2020)⁷. The Asia-Pacific region collectively accounts for 22% and Europe a further 18%.

Subsectors in biotechnology

Globally, the main segments of biotechnology are:

- Medical/healthcare biotechnology
- Agricultural biotechnology
- Industrial biotechnology
- Biotechnology services (includes bioinformatics)

The medical/healthcare segment of biotech is by far the largest, responsible for over half of the biotech industry's value⁸. Medical biotechnology focuses on the research of living cells and organisms for the development of new drugs and medical treatments⁹. Recent advancements have included stem cell research and vaccines for COVID-19. The agricultural segment focuses on developing crops with increased yields and insect-resistances, as well coeliac-friendly foods¹⁰. Industrial biotechnology firms aim to create more environmentally friendly products and chemical processes. Examples include biofuels and new enzymes for adaptation in existing chemical processes¹¹.

Current trends and drivers

The aging population in Australia and the rest of the world has contributed to the increased activity in health-related ventures. This is because the ageing population has created demand for additional research in areas for illnesses without a known cure (an example is Alzheimer's). Increased life expectancy has also increased the onset of chronic diseases such as heart failure and cancer. This has contributed to the demand for new medical innovations. The COVID-19 outbreak has also shifted resources into the development of relevant vaccines and treatments.

Another driver for innovations in biotechnology is the high

rates of obesity¹². Development of new products in the health or foodtech segments of biotech will give rise to a healthier population.

Environmental biotech is largely driven by the demand for climate action in recent decades. Biofuels and lab-grown meat are both ideas that contribute to lower greenhouse gas emissions. Some of the technologies that can reduce our environmental impact are already in existence, but the challenge lies with marketing these as viable alternatives to conventional petrol and beef. Another key factor is the cost, since many consumers are typically unwilling to pay a large premium for greener options¹³.

Food technology developments have been driven by increased demand for specific diets and increased nutrition levels in existing foods. Food security in countries with lower-income groups is also another driver for exploration into more efficient food production methods and crops. Pesticide- and insect-resistant crops are other areas of exploration¹⁴.

Issues within biotechnology

Despite the great potential for biotech, firms within the industry also face many challenges. Like the pharmaceutical industry, developing a new biotech product requires research, clinical testing, and regulatory approval¹⁵. The whole process from research to first sale usually takes about 10-15 years¹⁶. Unlike pharmaceutical companies, however, many biotech firms will not receive significant cash inflows until they can successfully develop a marketable product. Pharmaceutical companies, on the other hand, can still generate revenue from their existing products should a new venture be unsuccessful. Worse still, a biotech firm may not even produce any cash inflows at all if their potential product(s) do not pass clinical testing and regulatory approval. The harsh reality is that biotech firms can spend millions on R&D, without any guarantee of success. Take for example, the development of a COVID-19 vaccine. Statista reported 1228 drugs and vaccines in development as of June 2021¹⁷, yet the World Health Organisation estimates that only 1-2% of these will be approved for widespread use¹⁸.

Due to the low probability of success in biotech, investors may be hesitant to provide the funds required by biotech firms because of the significant risks involved¹⁹. Combine a lack of funding with a small probability of success and it is easy to see why many biotech firms fail to reach the product market.

There is also little incentive for biotech firms to focus their efforts on developing products tailored to lower-income countries. In the pharmaceutical industry, profit-seeking firms will choose to focus their efforts on developing treatments for diseases common in the US, Europe, and Japan. This is simply because these regions provide pharmaceutical firms the highest returns on investment²⁰. Assuming firms in medical biotechnology use the same argument,

the inequality between higher- and lower-income countries will only widen. Governments and institutions will need to intervene in the market to ensure all nations have equal access to newly developed treatments.

But it isn't just firms that have issues. The government must strike a balance between innovations and efficiency losses in the market. Without government incentives such as patents and tax subsidies, many R&D projects will not be undertaken due to the risk of significant losses. At the same time, any successful biotech development will likely create a monopoly position for the relevant firm. This may require additional government subsidies and/or regulations to keep prices low for consumers.

Public policy considerations

Innovation in biotechnology is limited to the freedom provided by government policies. Some government policies are necessary, however, since biotechnological developments may give rise to new environmental and ethical issues.

The McKell Institute has previously suggested that a proportion of superannuation funds be compulsorily invested in venture capital, which in turn will increase investment in newer biotech firms²¹. By generating additional investment funds through superannuation, the government's budgetary position will also be improved; some of the government's existing subsidies to biotech firms can be funded through the Australian population. In theory, this idea will increase the number of successful biotech products. However, it will be difficult to implement in practice because superannuation has traditionally allowed Australians to choose where their investments are placed. If the government announced a mandate of venture capital investment in superannuation, many risk-averse Australians (especially those in or nearing retirement) may oppose the policy and vote for political parties that maintain the status quo.

Policy options can also be taken to increase R&D targeting diseases prevalent in poorer nations. Options could include investing in biotech R&D through non-for-profit organisations (such as the CSIRO in Australia), or providing subsidies for firms who invest in solutions catered to lower-income countries.

Coordination is essential

Given that biotechnology has the capacity to solve some of the biggest problems the world is currently facing, there is a strong incentive for continual investment in the sector. The biggest hurdle in many parts of the biotech industry are the risks. There are significant risks for any investment and R&D project within the sector. On the other hand, the eventual discoveries could eradicate diseases and help solve our climate crisis. If governments, research faculties and institutions around the world can develop agreements together, lower-income nations will be able to benefit from emerging biotechnological developments as well.

Jack Myers

Could Australia become a renewable energy powerhouse?

Are Australia's climate and economic goals really mutually exclusive? Jack Myers explores how Australia could tackle both, by capitalising on the opportunities served up thanks to a growing appetite for renewables globally.

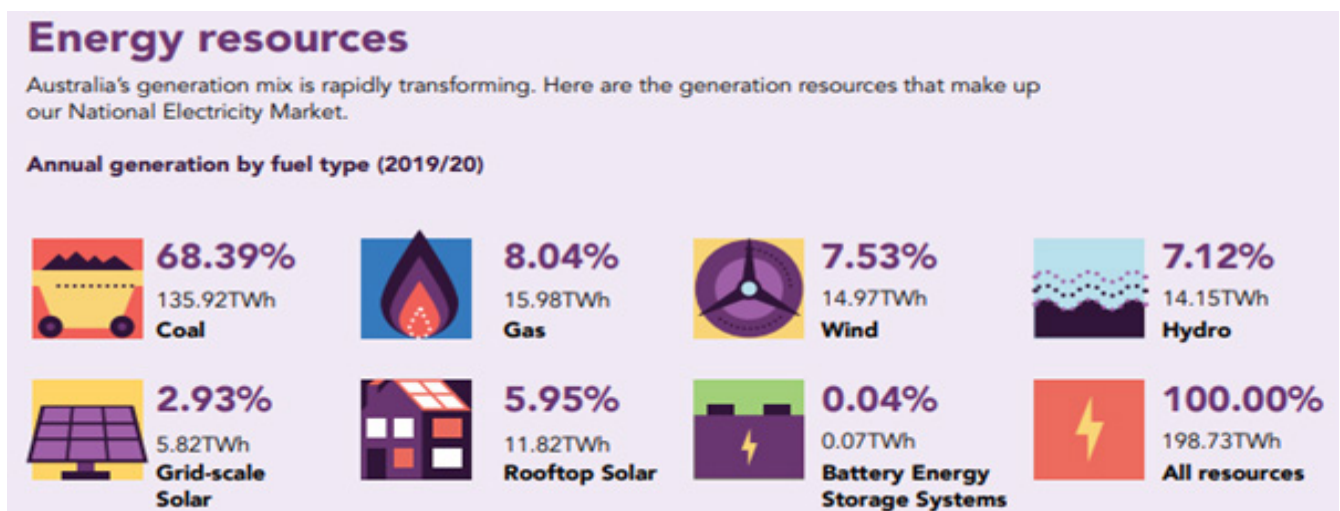
It is a popular belief that choosing between the health of our environment or our economy is a zero-sum game – we can't curb emissions without destroying industries, jobs and livelihoods. This is in part due to the tangibility of the consequences – It is a lot easier to communicate the economic value of a lost job in the present, in comparison to explicating the effect that reducing emissions today has in a few decades. But what if there was a way that Australia could hit a home-run in both? Renewable energy presents us this opportunity. Through our endowed comparative advantage, we are uniquely positioned to capitalise on the global transition to a net zero world by swiftly adopting clean energy technology.

Renewable energy is energy that comes from natural sources that are constantly replenished. While both fossil fuel and renewable energy generation require large initial investments in capital, renewables have a distinct cost advantage when operational. This is due to renewables' lower marginal cost of generation, which arises because they do not incur fuel costs like fossil fuel sources do. Despite this, some renewables such as solar and wind present problems in matching supply with market demand due to their intermittent and fluctuating nature.

Australia currently relies on a variety of sources of energy to generate electricity, including coal, gas (LNG), solar, wind and hydro. We still rely on coal to meet the bulk of our energy demand, and in 2020 it accounted for 68.39% of our annual needs in the National Energy Market (NEM)¹.

Alongside being used to generate electricity here, 75-80% of the thermal coal we extract is exported for use internationally². As of May 2021, the coal mining industry employed 43,000 people in the country. While it only makes up 0.3% of the labour force and contributes around 3.5% to national GDP, coal (when used in electricity generation) accounts for roughly 30% of our emissions, helping to give Australia its humiliating crown of the highest CO2 emitter per capita in the OECD^{3,4,5,6}. As you can imagine, maintaining our current energy generation mix also doesn't bode well for our Paris agreement pledge to cut emissions by 26-28% of 2005 levels by 2030.

Although this sounds a bit bleak, it's not all bad news. Renewable energy investment is on the rise, as the private sector begins to cotton on to both the merit and potential of renewables. In addition, the percentage of Australia's electricity from clean energy sources has risen 10% in the past 5 years⁷. We have also recently been observing renew-



The generation mix of the National Energy Market (NEM) in 2020 which covers QLD, NSW, VIC, SA and TAS. Source: AEMO

ables set new records in our electricity market, such as the 5th of September where they accounted for 57.3% of the energy in our main grid⁸. Let's dive in to perhaps one of the best opportunities we have to capitalise on the global shift to net zero.

Australia's renewable advantage

Australia is lucky enough to have been blessed with a number of key trump cards for a clean energy future. For one, we possess stronger and more consistent sources of renewable energy relative to many of our neighbours. This stems primarily from our proximity to the 'roaring forties' along our southern coastline for wind energy, and our arid, sprawling deserts in the country's north-west for solar energy. While there are other countries that also have great renewable resources, we belong to a small group that are sufficiently developed to be economically capable of funding the systems required to harvest them. Furthermore, with more than 85% of Australians living within 50km of the coastline, we also have an abundance of space inland in which to build the required infrastructure⁹.

This means that we are well poised to transition our domestic energy system to renewables, allowing us to make a good chunk of the required cuts in our emissions. While it is not yet clear whether renewables will materially lower wholesale electricity prices, the bulk of our opportunities emerge from acquiring the ability to generate clean energy at a lower cost **relative** to other countries. This means that, under the assumption that all economies will shift to renewables, we will possess a comparative advantage thanks to lower large-scale electricity costs, as a result of our aforementioned natural endowments.

There are a number of ways that we can utilise this advantage:

Industry and commodities:

For those who mourn the bygone heyday of Aussie manufacturing, cheaper electricity may afford us the opportunity to once again compete in the international market for production of a number of refined goods. Australia has large deposits of several key materials used in renewable technologies, including lithium, silicon and other rare earth metals. Processing these for final use is often energy intensive, meaning that Australia could develop a plethora of new industries, whose competitive advantage would only strengthen as the switch to renewables accelerates. With new industries come new jobs, which is a major sticking point that could help alleviate tension regarding the transition away from fossil fuels. These industries will provide a clear alternative for those who find themselves structurally unemployed as we move towards net zero, which may also help to alleviate political tension surrounding our future commitments.

Direct electricity exports:

Another of the methods proposed to export renewables is by direct transmission to other countries. This nascent industry is already beginning to grow, with firms like Sun Cable working on projects to export clean electricity to Asia. Sun Cable, backed by the likes of Mike Cannon-Brookes and Andrew Forrest, plans to export harvested solar energy from the Northern Territory to Singapore via underwater high-voltage direct current (HVDC) cables. Singapore is a great example of a country that has pledged to transition to net zero, but its small land mass, high population density and lack of potent renewable resources leave it with few options to produce clean energy domestically. Sun Cable have estimated that this project could cater for up to 15% of Singapore's annual energy needs, and with energy demand in South-East Asia set to increase by as much as 60% by 2040, there is a large potential market for this burgeoning industry to tap into¹⁰. While there are of course logistical challenges attached to 4000 km of submarine cabling, its worth noting that there is already a vast network of over 426 underwater cables in place around the world (primarily for telecommunications and internet), meaning that it is not as outlandish a prospect as it might appear upon first impression.

Renewable hydrogen:

Using renewable energy to electrolyse water creates green hydrogen. This could allow us to manufacture green steel, which has a by-product of water instead of CO₂. Grattan Institute estimates that capturing just 6.5% of the global steel market could create 25000 manufacturing jobs¹¹. In addition, hydrogen is used to make ammonia (primarily used as fertilizer) and is also being explored as a potential future fuel source. If we can successfully create reliable green hydrogen, this opens the door to further new industries¹².

For all that's said about the climate crisis, it's good to know that the impending global shift presents us a wealth of opportunities for future prosperity too. However, to make the most of them we will need to be first movers in the industry, as otherwise the cost advantage relative to other countries will be squandered. Now that the economic case and the moral case have aligned, we finally have an avenue to pursue climate action to the benefit, and not the detriment, of Australians. As Ross Gittins aptly put it, "Australia has a global comparative advantage in renewable energy. We'd be mugs not to exploit it¹³."

Hannah Shiau

China's skewed sex ratios; impacts on the economy

How can the search for a girlfriend in a country with surplus men lead to both macro and micro economic impacts? Hannah explains how cultural and biological drives can affect the economy in interesting ways.

An estimate of 30 million Chinese men born between 1985 and 2005 will likely never find a partner.¹ As the men currently in this cohort had reached or are reaching dating age, we are now able to study the economic impacts of the excess number of men within the Chinese economy. In this article, we are first going to investigate how the political, economic, cultural, and technological environment in modern China created the skewed gender ratio. Then we will go on to explore how it exacerbated the aging population problem with its established negative economic effects. Finally, we are going to see how it had altered the behaviour of men within Chinese culture which created both macro- and microeconomic changes within the economy.

China's aging population

Originally, the ageing population problem was created through the government's population policies in conjunction with socioeconomic development and the rising costs of living. As seen in Figure 1, we saw a dramatic increase in the fertility rate to 6 children per women in the 1970s and then a decrease to less than 2 all within the span of three decades.² When the Peoples Republic of China was

founded in 1949, government policy and propaganda encouraged families to have several children while birth control policies were considered anti-Party. However, around the 1970s, using the Malthusian argument, it was decided that the nation did not have adequate resources to properly invest and support the growing population and it will interfere with economic development. The first phase of population control policy was between 1970-1979 where fertility decreased from 5.7 to 2.7 children through a non-stringent population control policy. It was only till the 1980s where the one-child policy along with forced abortion and sterilisation campaigns was introduced, causing the fertility rate to fluctuate around the replacement level of 2.1 in the following decade.³ In the 1990s, China experienced unprecedented economic growth following a phase of broad financial reforms which led to a fall in fertility exogenous to government policy. Women voluntarily chose to have less children and at a later age, due to education and work commitments as well as the rising costs of living.⁴ We saw the fertility rate decrease well below the replacement level to the current level of 1.3 according to China's National Bureau of Statistics.⁵

Figure 1: Trends in China's total fertility rate and the sex ratio at birth, 1949–2002



Source: Total fertility rate 1949–2002 comes from Lu and Zhai (2009). Sex ratio at birth 1960–1988 comes from Liang and Chen (1993). Sex ratio at birth 1989–2000 comes from the *China Population Statistics Yearbook*.

With an already aging population through fertility rates falling below the replacement level, the unbalanced gender ratio acted to exacerbate the issue. As with many cultures, Chinese culture's preference for sons meant that if families could only have one child, they will go to extreme lengths to ensure that the child is a boy. The one-child policy introduced in the 1980s happened to coincide with the introduction of prenatal sex selection technology. This subsequently led to an increase in the sex ratio as seen on Figure 1. However, it was not until the 1990s where the technology became inexpensive, widespread, and reliable which led to a drastic spike in the sex ratios. This change is also clearly demonstrated in Figure 1. Apart from the differences in sex ratio at birth creating the skewed sex ratios within the country, postnatal discrimination included infanticide, and the neglect of girls also played a role.⁶ However, when there are significantly less women than men, there will be less pairs of couples, and less children born. Even if fertility rates remain the same, there will be fewer young individuals supporting the elderly, and thus a further increase in the dependency ratio. China's old-age dependency ratio, which is the number of individuals aged 65 and over per 100 people of working age, is predicted to increase to 80-90 in 2060.⁷

Figure 2: Macroeconomic Changes

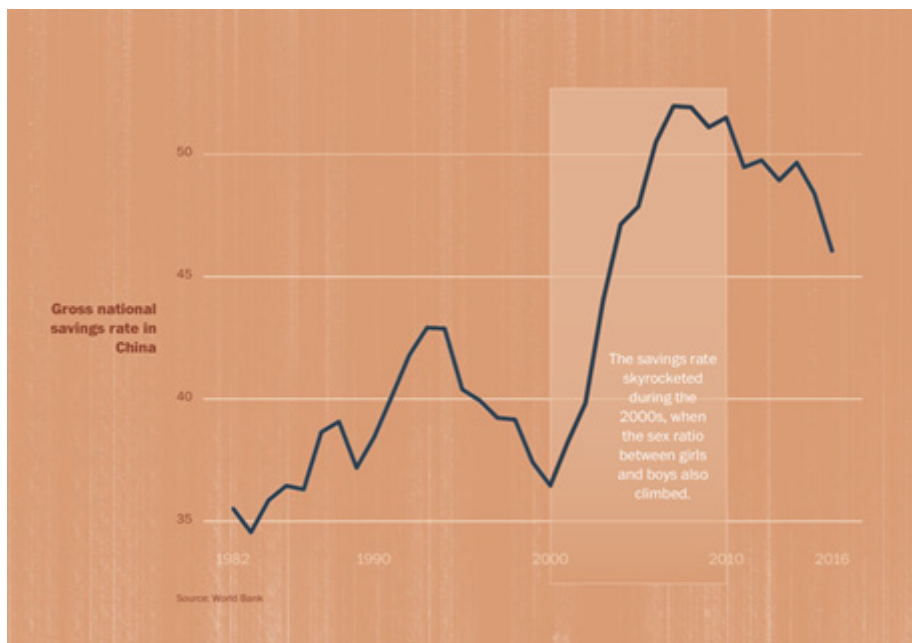


Figure 3

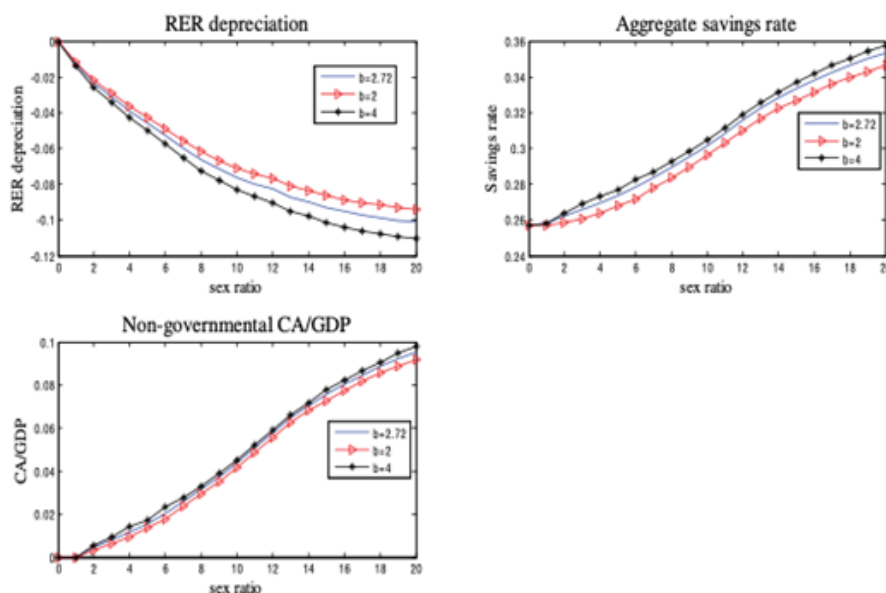


Figure 7: Impulse responses of RER, aggregate savings rate and CA/GDP, $\tau=20$

The high gender imbalance came with extreme measures to court a girlfriend or wife especially in a culture where marriage is of paramount importance. Marriage, alongside housing is seen as the most important milestone in life, a marker of adulthood, and is the only means to continue the clan's name and bloodline. Traditional families are associated with marriage and birth while bare branch families are associated with death.⁸ This is in contrast from Western countries where the single life is more widely accepted as a legitimate way to a happy life and there is little emphasis on continuing the family name.⁹

Male suiters will competitively strengthen their financial positions to become a more attractive mate since females strive to marry those who are more financially secure. This culture led to major changes within the economy. Du and Wei (2013) found that the increase in the sex ratio from 1990 to 2007 causally explains around 60% of the doubling of the economy wide household savings rate from 16% to 30%.¹⁰ The savings rate further skyrocketed after 2007 with the peak being over 50% in 2008, as demonstrated on Figure 2.¹¹ There is also a cultural emphasis in home ownership – in fact, a survey on the China Economic Daily in 2010 indicated that 80% of mothers object to their daughters marrying a man who does not own a home and according to the 2010 Marriage Market Survey in China 71% of unmarried women prefer that their future husbands own a home. When competition in the “marriage market” becomes tougher, house prices and the ratio of housing price to rent also increases. This is evident from the fact that average house prices are more expensive where the sex ratio is more skewed.¹²

As a result of the high savings rate, it also led to a depreciation of the real exchange rate where domestic goods are significantly cheaper than international goods. As savings rates increase, consumption decreases, reducing the demand for both tradable and non-tradable goods. Furthermore, as males are keen to not only save a higher proportion but earn a higher amount, an increase in the number of hours worked will lead to an increase in the supply of non-tradable goods relative to tradable goods, causing a further decrease in the real exchange rate. This partially explains why the Chinese exchange rate appears to be undervalued by 40% relative to its PPP. The relationship between the skewed sex ratio, savings rate and real exchange rate depreciation is highlighted by Figure 3.^{13,14}

Lastly, 20% of the growth rate in China's GDP per capita can be attributed to gender imbalances. This is because men are more likely to become entrepreneurial, take on risky jobs, and work for longer hours on their journey to become more financially strong.¹⁵

Microeconomic changes

The gender imbalance had led to a rise in black market activity and to new goods. Human Rights Watch, US Department of State's Trafficking in Persons Report (2017),

and academic journals such as the one by Shuai and Lou (2019) found that China's demand for women has given rise to the worst cases of human trafficking in the world where well-organised criminal syndicates lure foreign women in neighbouring Asian countries as well as other countries into China for forced prostitution, marriage, and labour with the false promise of employment opportunities. However, no reliable source of statistics to quantify the total number of women trafficked exists as gathering such statistical is difficult due to various reasons.^{16,17,18,19}

Furthermore, the inability to find a wife had also led to an increase in the supply and demand for illicit goods and services. China's crime rate has increased from 7.4 per ten thousand in 1982 to 47.8 in 2014, which corresponds to the time where the cohorts of surplus males were reaching adulthood, and the crime rates were much higher in provinces with higher sex ratios. There are two hypotheses for the increase in crime rates that are related to gender imbalances: the behavioural impacts of living with more young men and the increase in marriage market competition. It was found that the former explained only 6.3% of the increase in the propensity to commit crimes while the latter was the primary source. When men are striving to become more attractive in the marriage market, they will engage in illegal business dealings that has a high financial payoff such as engage in drug dealing and the provision of gambling venues.²⁰ When men cannot find a wife, they will also resort to abusing drugs and alcohol.²¹ In terms of emerging markets, the sex robot industry is currently booming thanks to the gender imbalance.²² However, good market data on the prevalence and acceptance of sex doll use is still lacking to see whether the market will grow or stay a niche market.²³

Conclusion

Culture and biological drives effect the economy in interesting ways. China's preferences for sons led to an exacerbation of the aging population with all its associated economic impacts: the biological desire to have a partner, in combination with the cultural expectation of home ownership, mean that savings rates and working hours have increased. This in turn led to a depreciation of the real exchange rate, an increase in housing prices, and an increase in the level of economic growth. It has also increased cases of human trafficking, illicit goods trade and rises of new non-illicit products. As Wei and Zhang (2011) states “Robert M. Solow [...] once said, ‘Everything reminds Milton (Friedman) of the money supply. Well, everything reminds me of sex, but I keep it out of the paper.’ Well, Solow might have missed something economically significant by not linking sex with economic growth, [...] an unbalanced sex ratio may be one of the significant drivers for economic growth.”²⁴

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