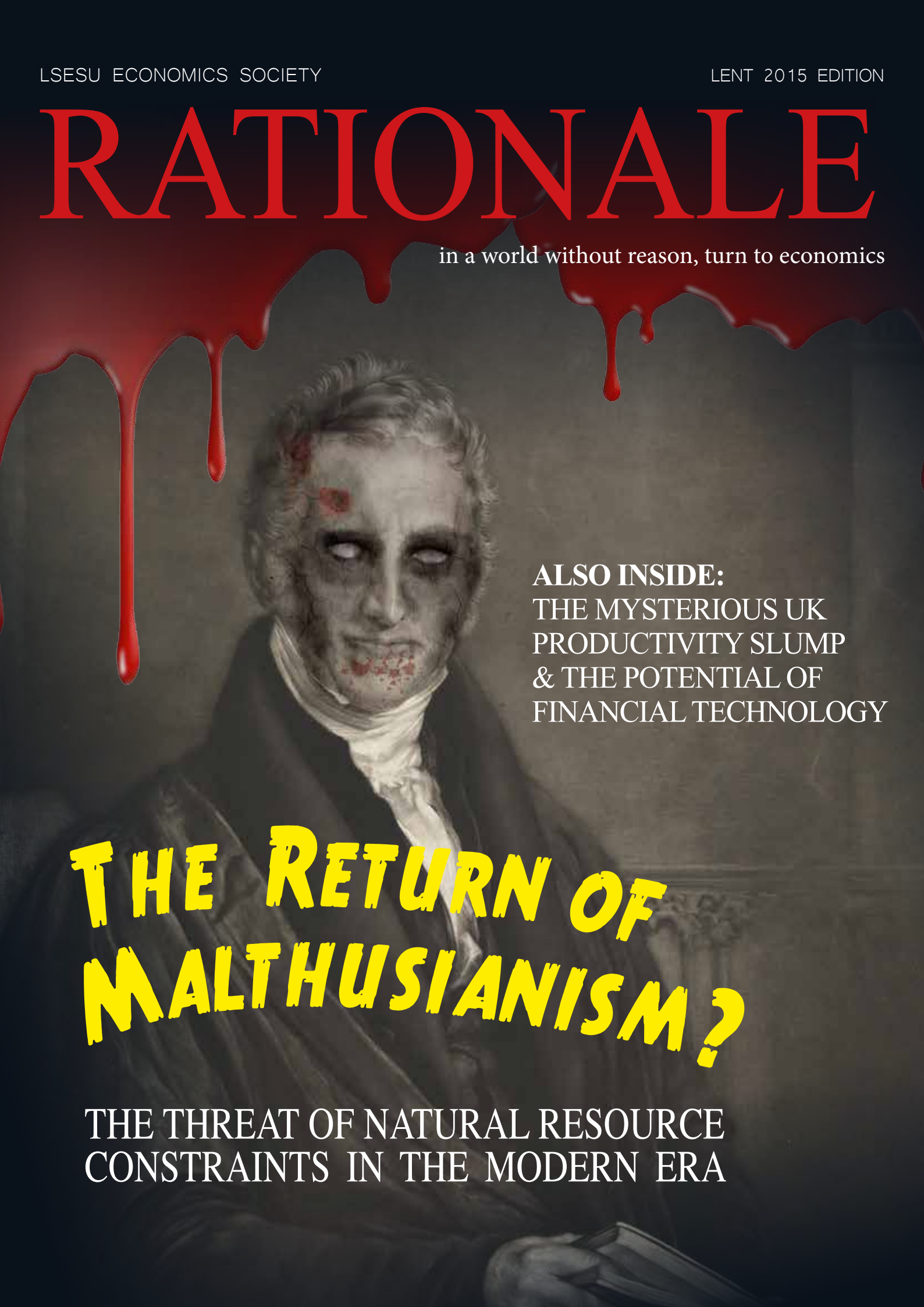


RATIONALE

in a world without reason, turn to economics



ALSO INSIDE:
THE MYSTERIOUS UK
PRODUCTIVITY SLUMP
& THE POTENTIAL OF
FINANCIAL TECHNOLOGY

THE RETURN OF MALTHUSIANISM?

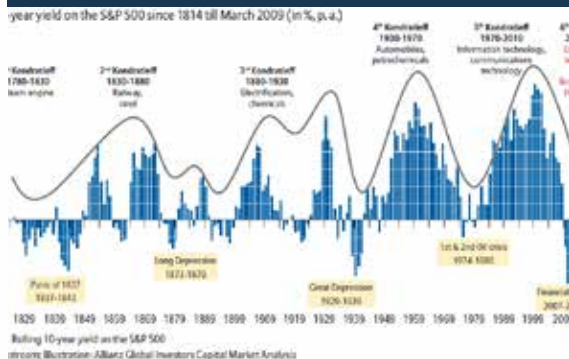
THE THREAT OF NATURAL RESOURCE
CONSTRAINTS IN THE MODERN ERA

Cover Art: Melanie Friedrichs

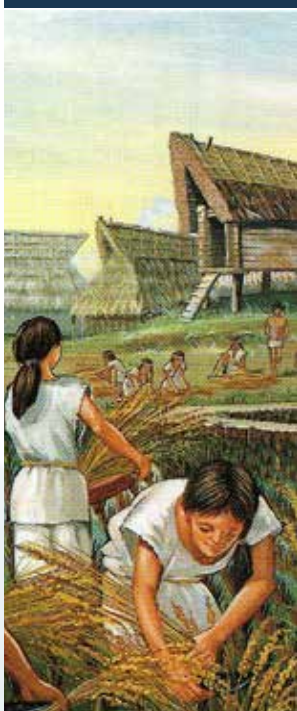


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LETTER FROM THE EDITOR

Dear Reader,

As the academic year draws to a close, with stress levels and cramming for exams reaching a crescendo, it is all too easy to lose sight of the bigger picture in the minutiae of our coursework. But once our exams are said and done, and as the warm, languid summer days roll by, I would appeal to all of our readers to consider the longer term sustainability of our aggregate human endeavours, and whether we need to re-examine some ideas that we thought were dead and buried. With this in mind, I proudly present to you the Lent 2015 issue of *Rationale*, which focuses on scarce natural resources and whether Malthusianism is still relevant today.

Justin Wiltshire and Tim Dobermann survey the history of growth since Malthus and how technology such as industrial fertiliser has enabled humanity to defeat the Malthusian trap. Melanie Friedrichs, Viktor Rehart and Maarten Hage bring various aspects of public economics into focus by examining the impact of externalities and overconsumption on our environment, and how they might be corrected. Those interested in the limits to growth in the Anthropocene era should check out Tim and Sugandha's editorial, while Melanie interviews an entrepreneur at the forefront of innovative energy conservation techniques. I myself review a recent lecture by LSE's own Professor Francesco Caselli on how natural resources curse some countries to political underdevelopment and war.

For allocating scarce resources, Sugandha Srivastav shows how new kinds of auctions can best allocate electromagnetic spectrum, while Ole Agersnap examines the economics of scalping. Mai Mahmoud and Matthieu Glotz talk about how international law and quotas can help avoid depletion of common goods such as fish stocks. Christine Farquharson rounds out our series of articles on natural resources by looking to the future of distributed renewable energy generation.

Of course, no issue of *Rationale* would be complete without a discussion on global issues. I consider how Nobel prize winner Robert Shiller's vision of a "Good Society" is being implemented by a new breed of financial technology firms, while Roberto Formenti examines the post-crisis regulatory regime. Closer to home, Stephen Chandler devotes his attention to the empirical quandary of why UK productivity has been so low, and Navreen Sandhu articulates the case for India's economic expansion.

I hope you'll find this term's articles more interesting and intellectually stimulating than ever, and thank you for your attention and patience. I would like to gratefully acknowledge the Economics Society for commissioning and funding the magazine, and thank all my fellow editors, writers and designers who I count as fast friends forged in this common endeavour. Finally, as we graduate and go out into the world, we should remember our vision for it while we were here. For we will be the next generation of leaders, thinkers, movers and shakers. A world short on reason will be turning to us.

Economically yours,

Honglin Jiang
Editor-in-Chief,
Lent Term 2015



THE TEAM



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IS MALTHUS RELEVANT TODAY?

THE CURSE OF RATIONALITY AND THE TRAGEDY OF THE GLOBAL COMMONS

By Viktor Rehart

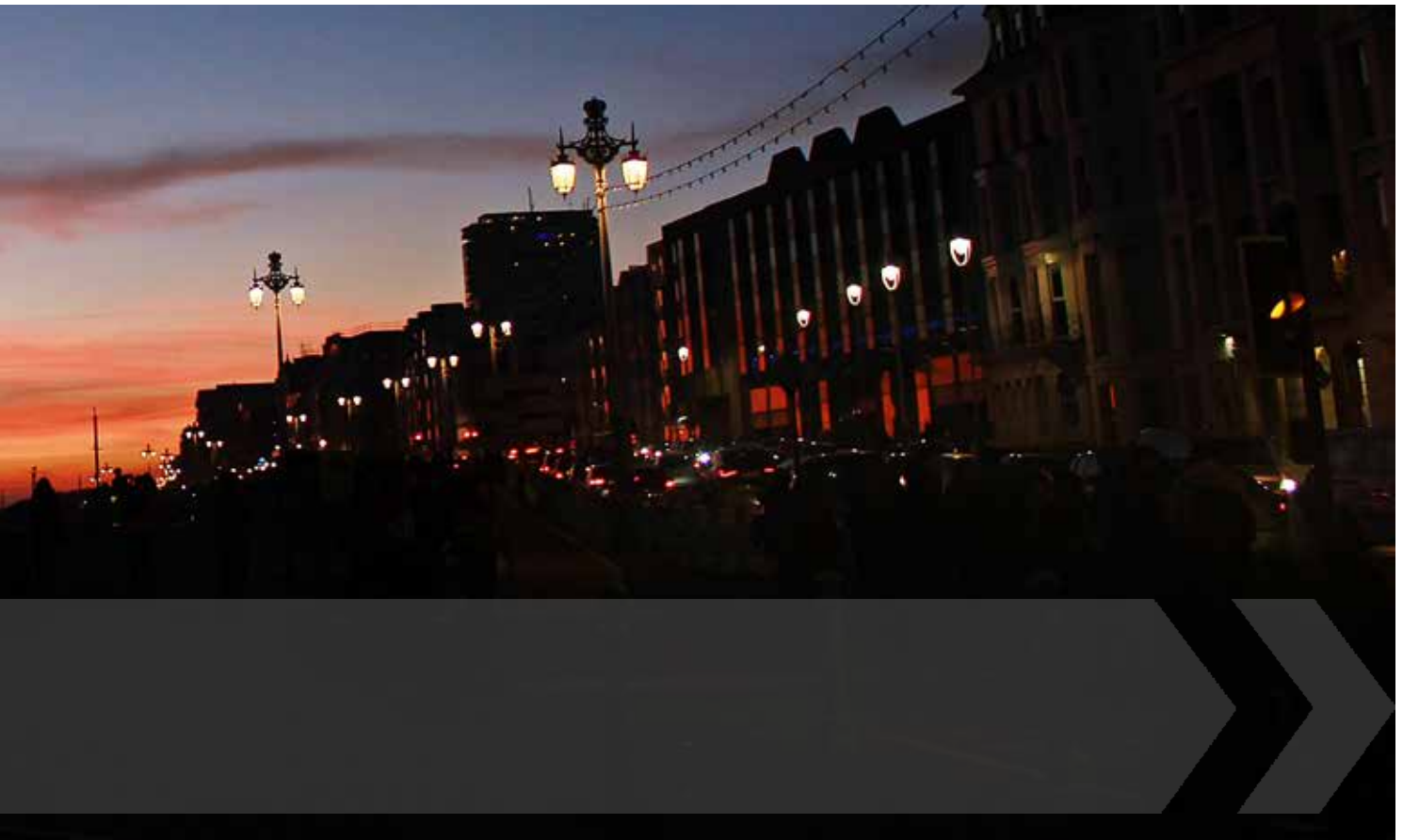
This article will revisit the much-discussed phenomenon of the “tragedy of the commons”. Garrett Hardin originally coined this phrase in his eponymous article in 1968. He concluded that the actions of independent, rational agents would eventually lead to the depletion, rather than preservation, of common goods. Therefore, it is often argued, government intervention is necessary to ensure the preservation of these goods.

This article shall demonstrate, that, despite its intuitive appeal, Hardin’s conclusion is far from trivial on a theoretical basis. It shall do so by starting with a definition of “Common Goods”, contrasting them against other goods. Afterwards, a simple game-theoretical model will demonstrate the appeal of the theory. Henceforth, the heuristic discussion of a more sophisticated model will point out the theoretical objections to Hardin’s con-

clusion.

Common goods are best understood through contrast with other types of goods. Consider a definition of goods with two properties: rivalry and excludability. The degree of rivalry captures how the consumption of the good is adversely affected by others consuming it as well. For example, a sandwich has a high degree of rivalry - someone else consuming the same sandwich as I am will leave less of the sandwich for my own consumption. Radio shows exhibit hardly any rivalry, since other individuals listening to the same station has little impact on my experience. Excludability measures to what degree it is possible to prevent others from consuming a good. For instance, air is a good with a high difficulty of exclusion, as it is very hard to prevent someone from breathing it.

Following this framework, four classes



of goods arise - public, private, club and common goods. In reality, it is hard to find pure examples of above goods, since there is almost always an adverse effect when too many individuals consume a good. These examples should therefore be understood as exemplifying the framework.

Now, the properties of the common good can be utilized to develop a simple one-stage game. Given that a common good is rival, one intuitively expects there to be interdependence between the players. Game-theory is therefore a sensible tool to use.

Consider an economy with two identical, rational, perfectly informed players. There is one common good, which players can choose to either extract a "high" (damaging) or "low" (sustainable) amount from. The good depletes if either player extracts a "high amount", imposing a negative externality on the other. However it regenerates in a sustainable way if neither extracts the "high amount".

The characteristic of the good regenerating over time is contained within

	High excludability	Low excludability
High rivalry	"Private Goods" (e.g. clothes, food, a car)	"Common goods" (e.g. fishing stocks, certain kinds of farmland, forests)
Low rivalry	"Club Goods" (e.g. concerts, pay television, cinemas)	"Public Goods" (e.g. national defence, streetlights, air)

Categorisation of goods along rivalry and excludability

their payoff if both players choose "Low". Their future gains from further consumption are captured through a higher payoff than if they both choose "High". If one of the players extracts a low amount, this leaves more for consumption of the player, therefore a player has the highest payoff if he chooses "High" while the other chooses "Low".

Hence, this game has a payoff matrix of the following structure:

	PLAYER 1, 2	HIGH	LOW
HIGH		2,2	5,1
LOW		1,5	4,4

Payoff Matrix of The Game

Readers familiar with game theory will recognize the above as an example of the infamous "Prisoner's Dilemma" game. In this situation, the outcome to be expected is for both players to choose "High". The outcome is inefficient, as both players would be better off choosing "Low". Fishing stocks are an often-cited example of games like this. Now, remember the game is about the extraction of resources from a common good. Even though both players would benefit more from choosing the strategy which does less damage to the good, they end up exploiting an excessive amount. The above example can furthermore be generalised to a case with more agents, without chang-

ing the outcome.

The Prisoner's Dilemma model lends support to the tragedy of the commons: rationality seems to dictate that agents choose the option leading to the depletion of resources. This happens despite the agents being aware of the long-term benefit to moderate consumption. Even though agents "know better" than to push resources to depletion, they often end up doing it anyway. Hence, government interference is required if there is to be any hope for sustaining common goods.

However, this result is far less robust than above example suggests. It seems to have abstracted from reality to a degree where it is dubious as to whether its conclusion can be applied to reality at all. The most intuitive problem with the game is the pay-off at "Low, Low". Is it really the case that being able to exploit common goods once yields a higher payoff than all future income which may be gained by it? The logical step would be to analyse an iterated version of game. In this case, the outcome may actually be players cooperating and both playing "Low".

One aspect influencing the outcome of the iterated game includes the time horizon of

the game. This is because towards the end of the game, players tend to have an incentive to deviate from "Low", which could hinder cooperation. Generally speaking, the longer the time horizon, the more likely cooperation is. Players also usually apply a discount rate to future incomes. The more patient they are, the higher the chance that they will be able to cooperate. Intuitively, if players could communicate and credibly convey to the other player their action, this might increase the scope for cooperation. Hence, the possibility for communication and signaling might remedy the problem at hand. In reality, players may often find it difficult to observe each others actions and intentions. The presence of asymmetric information or uncertainty could lead to mistrust and hinder future cooperation. However, it is hard to predict the exact effect without further assumptions.

Introducing dimensions such as the ones presented above challenges Hardin's conclusion. Theory is all but clear on the question whether rational individuals will always opt for the more damaging option. The tragedy of the commons is therefore definitely not an inevitable phenomenon in theoretical economics. ■

Private Good



Common Good



Club Good



Public Good



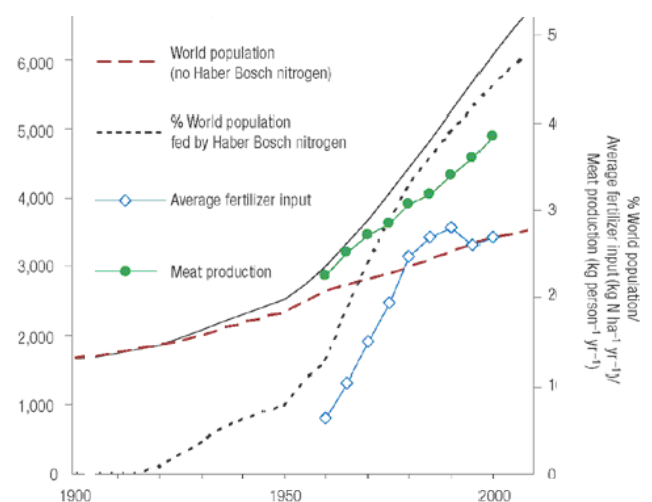
THE QUIET HERO: HOW FRITZ HABER SAVED US FROM THE MALTHUSIAN TRAP

By Tim Dobermann

Almost one in two people alive today owe their continued existence to the findings of a German chemist, Fritz Haber.

Hyperbole? Perhaps not. In 1909 Haber invented the first method to produce synthetic (inorganic) fertilisers on an industrial scale. The Haber-Bosch process synthesises ammonia from nitrogen and hydrogen gases in the atmosphere; the oxidation of ammonia creates components necessary for the production of nitrate fertiliser.

Impact of Haber on Population



This scalable process to harvest ammonia dramatically increased the availability of fertiliser for farmers. Fertiliser use has led to an explosion in crop yields and enabled the earth to feed an additional two to three billion people. Im-

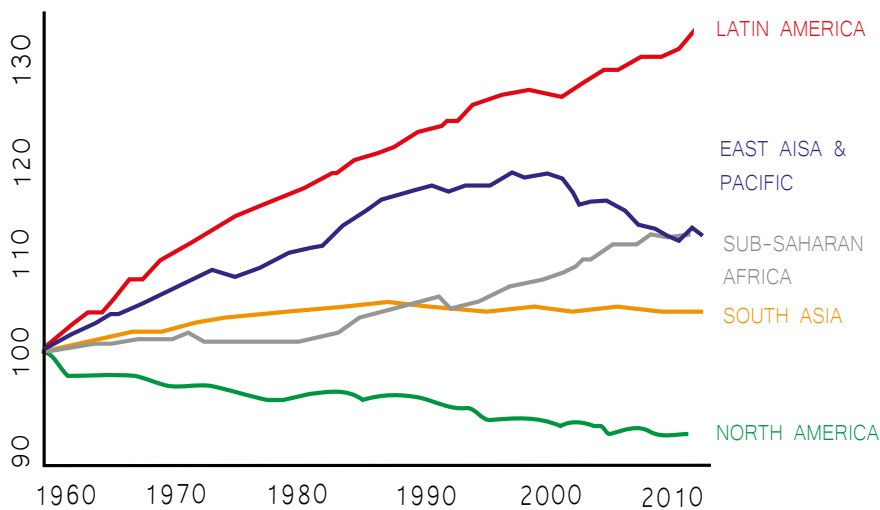
portantly, while population has more than doubled since 1950, average land devoted to agriculture has increased considerably less so. In fact, had agricultural yields remained their levels in 1900, feeding the world in the year 2000 would have required nearly four times more cultivated land, or nearly half of all ice-free continents.

This intensification of agriculture helped sustain a deep trend of structural transformation. Advanced economies, which were in by-gone times mired in agricultural subsistence, were now able to continue their shift towards manufacturing and service-driven economies without sacrificing – or worrying about – agricultural output. Unlike Malthus, Adam Smith celebrated the benefits of population growth: more people meant greater specialisation and larger possibilities for the division of labour. Incomes soared. Population has grown exponentially, as predicted by Malthus – but, in thanks to agricultural intensification, so too have our means of subsistence.

Using fertiliser is picking low-hanging fruit. While its deployment has been far from unanimous – many parts of sub-Saharan Africa still do not use synthetic fertilisers – it, like many productive technologies, suffers from diminishing returns. Typically farmers apply a carefully-measured mixture of nitrate and phosphate fertilisers two or three times per growing season to provide essential plant nutrients. Beyond these recommended dosages, additional use has little benefit for yields. What it does do, is damage the environment.

The production of fertiliser requires large volumes of natural gas, contributing to greenhouse gas emissions. Fertiliser runoff caused by excessive or improper application can pollute water sources and damage the ecological environment. Over time, continual use degrades soil fertility. These externalities have little

Land Area Devoted to Agriculture (1960 = 100)



bearing for poor farmers who are dependent on their harvests for current income. Those who do use fertiliser may over-apply in hopes of striking a record harvest. Largely, their efforts will be in vain, and as is often the case, will come at the long-run cost of others. Developing a mechanism facilitating the transfer of fertiliser from excessive users to non-users would be

was defused; unprecedented efforts to reduce fertility levels, extraordinary advances in agricultural practices and technology, and a widespread opening-up of international markets countered the growing pressure. This time around, the world was fed by breakthroughs in the breeding of high-yielding and resilient crop varieties, ushering in a new ‘Green Revolution’ for the world

in the late 1960s and early 1970s. For most, incomes kept soaring; consumption continued to grow.

The situation, today, is again sombre. Combined economic, demographic, and now also ecological pressures are once more threatening global food security.

At a time when investments into agricultural

innovation and technology are stagnant or declining, is blind faith in an imminent Haber 2.0 rational? Demand for food is expected to increase upwards of 70% by mid-century. With the sun having set on the Haber honeymoon, a new series of technologies and market mecha-

“ Feeding the world in the year 2000 would have required nearly four times more cultivated land, or nearly half of all ice-free continents. ”

improving for all, but remains difficult.

Fritz Haber gave us a half-century of breathing-space in the early 20th century. It only took until 1968 for Paul Ehrlich to heed the next Malthusian call of a global ‘population bomb’ at our doorstep. Once again, the bomb

nisms will be needed to ensure global demand is met.

First, subsidies and other barriers which distort or prevent an optimal distribution of food resources should be removed. In many developed societies, the price of food is far too cheap; prices should internalise the externalities of agriculture, one of the largest sectors contributing to global greenhouse gas emissions. Second, the trans-

fer of technology and spread of best practices in agriculture to poor areas, particularly in Africa, will be needed. The widespread mechanisation of agriculture in Europe and North America offers a blueprint for these developing countries, but many technologies will have to be appropriately adapted - machines that get stuck in the mud are of no use. Lastly, greater public and private investments into newer crop

varieties, including drought-resistant strains, flood-tolerant strains, and C4 rice (with enhanced photosynthesis) will desperately be needed.

Is Haber 2.0 close by, or far away? Malthus may have been proved wrong, but his spirit remains. R&D and mechanisms facilitating the better transfer of resources and technologies have the potential to defuse today's bomb, but they are by no means a guarantee.

HOW TO SAVE THE ENVIRONMENT: TAXATION OR TECHNOLOGY? By Melanie Friedrichs

In undergraduate economics, saving the environment seems easy. Most environmental issues such as pollution, deforestation and climate change can be classified as negative externalities: instances when costs or benefits are not accurately reflected in the market price. To correct externalities, the government can impose a "Pigouvian" tax to shift competitive equilibrium to its socially optimal level, or set an equivalent quota. Few results are more classic.

Reality, of course, is never so simple. The exact cost of an externality is impossible to quantify, and therefore Pigouvian taxation will always under or overshoot the optimum. In the face of uncertainty, ideology is often necessary to calculate the "social cost". When the extent of the externality is contested or when constituents benefit unequally, taxation may be politically infeasible.

Taxation is only one of many tools policymakers can use to address environmental issues. Perhaps the simplest (albeit limited) tool is education. For example, through advertising consumers can be 'nudged' into altering their consumption habits in a manner that takes into account social costs. In addition, goods may also have a private cost that is not understood by the consumer such as the electricity intake of appliances. In the United States, the Leadership in Energy and Environ-



Saving the environment can still be sexy

mental Design (LEED) program and Energy Star program certify the energy efficiency of buildings and consumer products. These programs help consumers anticipate the amount of electricity they will need, and result in decisions that internalise the true costs.

Arguably, one of the most important tools available to policymakers may be the ability to encourage technological advances to mitigate environmental issues. Technology is usually absent from lessons on externalities because general microeconomic theory does not deal with growth (the size of the pie is fixed). In practice, however, new technology (such as renewable energy)

can reduce the negative externality caused by certain types of consumption, or even eliminate it entirely.

To encourage innovation, the government can either directly sponsor research or subsidise the R&D efforts of private firms. Both the US and UK governments support a number of schemes for green technology. A notable initiative is the UK's £3 billion Green Investment Bank created in 2012. The Energy Star and LEED programs provide a less direct but perhaps more cost-efficient innovation incentive: by the creating consumer demand for energy efficient products, they encourage producers to innovate; and when producers do,

LEED and Energy Star can raise their standards and create new incentives for innovation.

Technology is in many ways an ideal policy tool because it requires no reduction in consumption. For example, instead of driving less because Pigouvian-taxed gas is more expensive, we can drive the same amount as we did before, and harm the environment less because of energy efficiency. Technology also frees policymakers from ideologically fuzzy calculations; it is relatively more politically agnostic than taxation.

But can technology save the environment? Technology that increases energy efficiency, like hybrid cars or insulated refrigerators, also reduces the price of energy. Returning to undergraduate economics, we know that a reduction in the price typically raises demand; so an increase in energy efficiency could increase the consumption of energy (depending on its elasticity of demand). This observation was first made in 1865 by William Stanley Jevons, one of the founders of modern economics. In his book “The Coal Question” Jevons noted that improvements in coal-dependent technology increased the demand for coal.

Empirically, many researchers have found evidence of a “rebound effect”—an increase in the consumption of energy due to lower price—but in most studies the rebound effect is low meaning that there is still a net environmental benefit to energy efficiency. Of course technology also has the potential to change the game entirely. At the moment there are qualms and tech-

nological constraints associated with solar, wind and nuclear energy that make it difficult to eliminate the world’s dependence on fossil fuels. However, with sufficiently large technological advances (such as commercially viable battery storage for solar power), renewable energy could become increasingly competitively viable.

In the 1950s Simon Kuznets hypoth-

“ ... one of the most important tools available to policymakers may be the ability to encourage technological advances ”

esised that as income per capita rises, inequality first increases and then falls, following an inverse U-shaped curve. Kuznets believed that the natural trajectory of industrialisation and post-industrialisation growth would create such a curve. Other economists, including Daron Acemoglu, argue that political and not economic evolution is required to tip inequality on its downward path. In 1991, the Kuznets curve was applied to the environment as the “Environmental Kuznets Curve” or EKC, the hypothesis that environmen-

tal damage will first increase and then fall with income per capita.

If you believe that technology can save the environment, you accept the “Economic” EKC, the idea that the natural evolution of the economy will eventually taper pollution, reverse deforestation, and free us from dependence on harmful fossil fuels. Government policy to encourage innovation can speed up this process and so reduce total damage with minimum sacrifice. If you believe, on the other hand, that at some point consumers must deliberately reduce energy consumption, or equivalently, that Pigouvian taxation or quotas are necessary for the preservation of the planet, then you accept the “Political” EKC, the idea that the environment can only be saved by intervention and conscious choice.

So far only a few environmental issues have seemed to comply with EKC at all, most notably US emissions of certain air pollutants, including carbon monoxide and sulphur dioxide. The change is normally attributed to new regulations on automobile manufacturers, a primarily “political” intervention. Other measures of environmental damage, however, including household energy consumption, deforestation, and chlorofluorocarbon emissions have been growing at a steadily slower rate over the past decade and show signs of (possibly) reaching peak. It is unclear if better technology and current taxation regimes will get us over the hill, or if additional taxation is necessary. The most important question is can we risk the wait? ■



LIMITS TO GROWTH AND THE NEXT KONDRATIEFF

By Tim Dobermann and Sugandha Srivastav

Are all graphs the same? Expand the timeframe long enough, and history might lead you to believe so. The best word to describe the dynamic behaviour of the world economy and its impact on natural systems is 'exponential'. In 2007 the first global-scale census of deep ocean ecosystems found a direct relationship between biodiversity in these ecosystems and their ability to function. Rapid biodiversity loss has hampered the ability of our oceans to break-down waste and provide nutrients. Resource use, production and population have grown at an increasing rate. This is adversely impacting not only the earth's aquatic biomes but also its forests and grasslands. Anthropocentric mindsets have ushered the world into a new

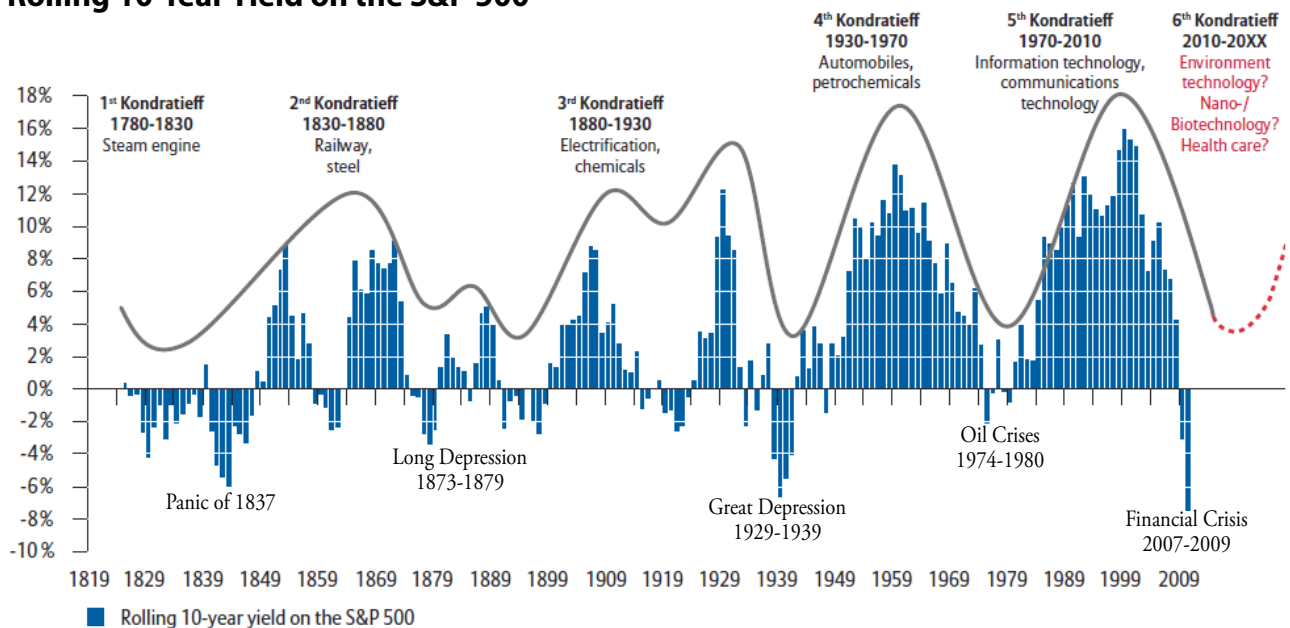
era dubbed as the Anthropocene: this is an era where man's actions can affect the environment in profound ways that include desertification, climate change and biodiversity loss.

The phrase 'limits to growth' first entered public discourse in 1972 through a report commissioned by the Club of Rome. The concept is that exponential growth cannot continue unabated under a finite resource base. Eventually, the extractive effects of production and consumption will reach a threshold, beyond which damages to the environment outstrip the material benefits. At this point, systemic collapse becomes imminent.

Rapid industrialisation and advancements in technology (most notably the invention of the steam

engine) allowed human society to extract resources for production and consumption at an unprecedented rate. An example is of how British iron production increased by 2500 percent in a short span of years (between 1796 to 1854) due to the invention of the steam locomotive. Improvements in medicine, agriculture and sanitation enabled the world to support a much larger population. However, this growth, albeit remarkable, came with its share of negative externalities. Scientists have declared the current era as the sixth great mass-extinction event in earth's history, with human activity as the sole cause. Yet if technology could bring us to this turning point, it is also technology that may help us escape the potentially disastrous

Rolling 10-Year Yield on the S&P 500



Source: Datastream; Illustration: Allianz Global Investors Capital Market Analysis

consequences of the Anthropocene.

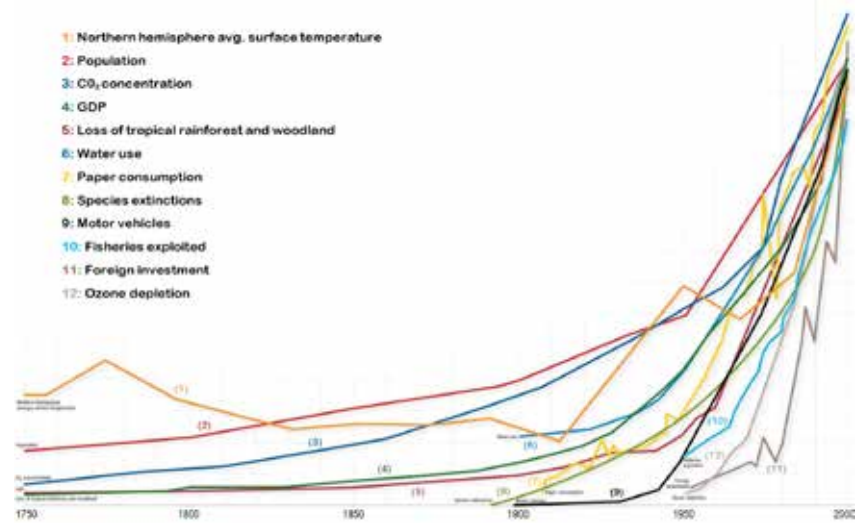
We have reached an inflection point where society must consciously endeavour to move away from its modus operandi of 'business as usual' to internalise, into its daily functioning, the existence of planetary boundaries which, if surpassed, threaten future living standards.

Peering across history, economist Nikolai Kondratieff observed long-term fluctuations, typically between 40 to 60 years in economic activity. The boom-bust patterns begin with innovations in technology. These innovations spread across all sectors in the economy and lead to a surge in output. The switch between the recessionary period into the boom phase comes from the replacement of old, exhausted technologies which can no longer meet rising demands. New and unpolished versions of the technology require significant financial capital initially, after which society enters its latest 'Kondratieff', with increases in output and productivity.

The first Kondratieff was centred on the development of the steam engine and the explosion of industrial activity that followed. The most recent cycle stemmed from computers and ICT. We now appear to be on the cusp of the newest Kondratieff, one which is likely to focus on advancements in green technology, nanotechnology and health-care.

Previous waves, such as the ICT revolution, resulted in massive increases in labour productivity. Climate change and pressures on other planetary boundaries have made the environment a scarce resource. The next Kondratieff will have to emphasise increases in resource and energy productivity. How – and how well – resources are used for production will be fundamental determinants of whether future economic growth can be sustained on a planet with finite natural endow-

The Emergence of the Anthropocene



ments.

It is no guarantee that the next wave of innovation will be sufficient to combat the mounting pressure society has placed on the environment or if it will arrive on time in the absence of concerted human effort against climate change. Markets alone may not be able to steer society out of

graphs are the same; the damage that emanates from climate change is not linear but convex in emissions. And by the same token, abatement costs are also not linear, but exponential – meaning the longer we wait, the more expensive it becomes to mitigate climate change. The risk of a tipping point necessitates that loss aver-

sion is at the heart of policy design.

The 21st century will see a flurry of innovations and advancements in technology as we enter our next Kondratieff. Much will change. If we are to avoid the limits to our growth as a collective species, advances in technology should be met

“ *Scientists have declared the current era as the sixth great mass-extinction event in earth’s history, with human activity as the sole cause* ”

the ‘business as usual’ scenario. We will need to see different actors such as the state, the private sector and households act in unison to tackle this transboundary challenge. In the optimistic scenario, tackling climate change could represent one of mankind’s most profound, cross-country coordination efforts.

The longer the damage to our environment goes unabated, the greater the consequences. For, as shown, all

hand-in-hand with changes in policy and social attitudes. A good starting point would be to truly internalise the cost of carbon emissions into energy prices and to implement such transitions in a phased manner. This will allow society the necessary time to innovate its way out of subsistence: something it has done before and it can do again, in the era of the Anthropocene. ■



1 1000 1500 1600 1700 1820 1870 1900 1913 1940

In 1798 English academic and cleric Thomas Malthus published a treatise warning against the dangers of unchecked population growth. Malthus was principally concerned with the ‘distresses of the common people,’ which he saw as the direct result of the insatiable human propensity to copulate. Malthus believed that if output ever managed to grow more rapidly than the population, leading to higher per capita wages, the burning passions of the miscreant masses would drive birth rates higher, increasing the labour supply and pushing wages back down to subsistence level. If reproduction increased without an increase in productivity, population would be reduced by some “Malthusian check”: famine, war, or plague. Without moral restraint, Malthus predicted, reproductive indulgences would lock the bulk of humanity in a perpetual state of misery.

Malthus inspired two centuries of pessimism predictions and population control advocates, from “The Malthusian League” founded in 1877 to

“ *What Malthus ignored was the possibility of sustained technological progress* ”

Paul Ehrlich’s “The Population Bomb”, written in 1968. Dire predictions in the Malthusian vein about the consequences of natural resource shortages, rising food prices, or exponential population growth continue to make

headlines and hold influence today. Yet, while a sound evaluation of the underlying argument requires more nuance than a simple right-wrong pronouncement, the weight of evidence is firmly against Malthusianism.

At first glance, one might reasonably sympathise with Malthus. With the exception of some temporary increases in wages prior to 1800 AD the bulk of humanity had more or less been scraping by at subsistence levels for its entire existence. Women and infants routinely died during childbirth, children often died of disease or starvation, and adults typically had little wealth to sustain them once they became too frail for work. What Malthus failed to properly consider – and, more unforgivably, what many of his proponents today ignore – was the possibility of sustained technological progress and its effects on economic incentives and choice.

MUCH ADO ABOUT MALTHUS:

WHY OVERPOPULATION PESSIMISM DOESN'T FACE THE FACTS

By Justin Wiltshire

Long run growth in Global GDP



1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005

Though some mild growth in per-person incomes had already begun by 1500, it was the Industrial Revolution which took hold in the late eighteenth century that freed first England, then Europe and America, and eventually most of the world from low-productivity subsistence living.

By 1820 GDP per capita had taken off, at least in the West, with higher productivity creating wealth in two ways: first, existing commodities could be produced more cheaply and in greater quantity, and second, resources freed by this more efficient production encouraged entrepreneurs to dream up new goods to meet new demands. Though a disproportionate share of the new riches accrued to a wealthy minority, real wages rose across the board.

As wealth grew, nutrition and medicine improved. The result was a population explosion in West. Yet this wasn't

and having more babies, as Malthus predicted, but rather due to lower infant and maternal mortality rates, and longer lifespans. Fertility rates in Western countries actually remained more or less flat for most of the nineteenth century before beginning a long decline, ultimately to levels below the replacement rate. Today, population growth in most developed countries is due almost entirely to population momentum (due to different generation sizes) and immigration.

As higher wealth levels and the benefits of modern medicine gradually made their way outside the West, fertility rates in other countries began to fall, too. The Earth's population is projected to peak below ten billion in the latter half of the twenty-first century, and then begin a rapid decline.

Most economists approach the study of human behaviour in the same way: given the constraints we face (limited

time, money, etc.) and our own unique preferences, we make decisions that we think will make us as well off as possible. Parenthood is no different. Subject to preferences and constraints, including the well-being of children and the costs of child rearing, parents have the number of children that they think will make them as happy as possible.

If this is true, why would higher levels of wealth lead to a reduction in population? Children are costly, after all, so shouldn't poor people want fewer children? The answer is that it's all about trade-offs. Children may require food and clothing, but in pre-Industrial societies they were also an important source of labour, and the extra output they produced tended to outweigh the cost of raising them. What's more, because saving for retirement was difficult for subsistence farmers, and there were few social safety nets, people needed children to look after them

in their old age. High infant mortality rates also encouraged higher birth rates, to ensure some children survived.

As incomes grew, people shifted from subsistence farming to more lucrative work and were better able to save for retirement. Children suddenly had much less economic value to parents. Medical advances lowered infant mortality rates. Less frequent childbearing and better nutrition meant women remained stronger, healthier, and more productive for longer. Social changes that opened up economic opportunities for women also increased the opportunity cost of raising children. Parents instead substituted out of quantity and into quality of children, investing dramatically more in the healthy development of relatively few offspring.

The Takeaway

Malthus warned that if humanity did not morally restrain itself from indulging its most wanton desires, it would be stuck forever in long-run subsistence living, with any productivity gains only translating into larger populations.

And yet the opposite has happened.

Technological progress has allowed across-the-board increases in real

“ *Although 200 years of growth have saved us from the Malthusian trap, not everything is rosy* ”

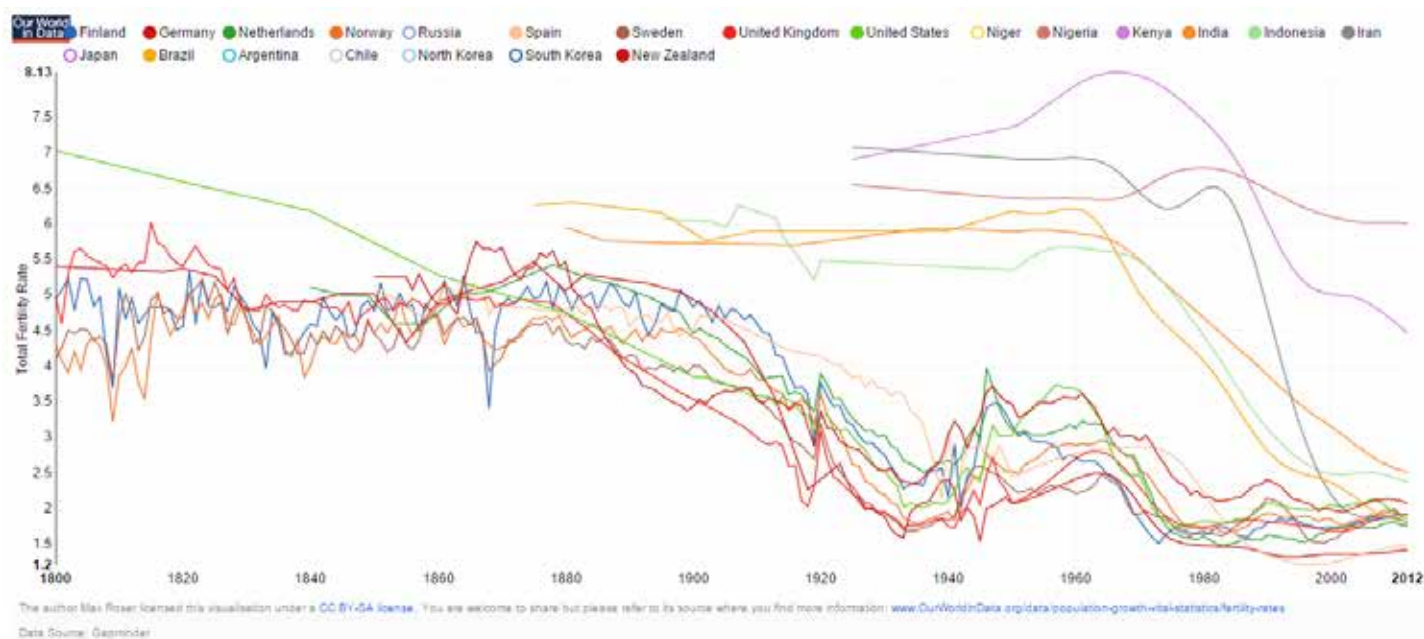
wealth. In the West, real wealth rose for most people from the 1800s until the middle of the last decade, and will likely eventually resume its upward climb. Though it took longer for economic growth to spread to today’s less developed countries, real incomes for most people are rising there, too, and will likely continue to do so. Excepting those tragic corners of the Earth gripped by perpetual violence, most of the world’s people are significantly wealthier in real terms than their ancestors were two hundred years ago.

This is despite (and partially because of) dramatic growth in the global population.

Malthus was wrong, but sharp Malthusian or Neomalthusian warnings about the consequences of overpopulation persist, typically due to a failure to grasp two important realities: technological change creates economic opportunities, and people respond to economic incentives.

Although 200 hundred years of growth have saved us from the Malthusian trap, not everything is rosy. Growth has had significant negative environmental consequences, too many people remain in unacceptable poverty, and women everywhere still face significant economic discrimination. Yet none of these evils are necessary accompaniments to further economic growth or population growth. It seems likely that the vast majority of material ills will be eliminated by the same forces that allowed us to make the jump from concupiscent agricultural subsistence to digital sterility in a mere 200 years. The only question is why Malthus got to skip the wait. ■

Total Fertility Rate (Children Per Woman) Over the Long Run



Total Fertility Productivity

SATISFYING OUR MODERN ENERGY NEEDS: FROM WHALES TO WINDMILLS

By Maarten Hage

By the early 20th century, John D. Rockefeller - the founder of Standard Oil - had amassed a fortune that Bill Gates could only dream of. Standard Oil was founded in 1870 - a time when trains and ships ran on coal, the car was yet to be invented and the Wright brothers had not

even been born yet. So who was buying all of Rockefeller's oil? Probably your great grandparents were. In the late 19th century, whales had been hunted to near extinction for their blubber and whale oil had become unaffordable. However, most American and

European households had become accustomed to the luxury of lamps. Rockefeller simply took advantage of the pent up demand for light. He was able to quickly build up the significant infrastructure needed for the production and distribution of oil, safe in the knowledge that there was a large market waiting for him

Nowadays life without fossil fuels is unimaginable. Once again though, energy is becoming unaffordable. But unlike whale oil, this time prices are not signaling the real cost. Oil barrels are by no means as scarce as whales in the 1870's. Peak oil is still a long way off. For the many benefits they have brought us, fossil fuels also come with the biggest externality the world has ever seen: climate change. The free market fails to determine a price which internalises the social costs of

producing oil. The problem is that the producers only face part of the cost of producing fossil fuels. In the economic jargon, we would resolve the market failure by setting the private cost equal to the social cost. Loosely speaking, we should factor the cost of climate

change into the cost of petrol. The higher price reduces the equilibrium quantity and equates the benefits of using fossil fuels with the full cost (climate change and production costs).

The above argument may have convinced you to increase

fossil fuel prices. However, it is unrealistic to expect any government to use taxes to meaningfully increase the price of fossil fuels in the short term. The world continues to increase emissions against all scientific warning. Efforts such as the EU's cap and trade system have largely failed to put the correct cost on climate change. This is because energy prices are a political hot potato. Households directly feel the effects of energy taxation in their wallets and fossil fuels have become such an important factor of production that changes in the price have a significant effect on economic growth. These arguments are pervasive and powerful which is why attempts at pricing the cost of carbon into the price of fossil fuels have so far been feeble.

Frequently, the debate centers around reducing the quantity of fossil fuels

consumed versus the economic downsides of high prices. This is a shame. The low price certainly allows oil to be over consumed, but we often forget it also reduces incentives to innovate. Because the free market price does not include the costs to climate change, green technologies that have a lower social price are not developed because in the free market they cannot be sold profitably. It does not matter which alternative energy one prefers, since they all have one thing in common - they are more expensive in a free market than fossil fuels. Yet, socially, they may well be cheaper. The incentive to innovate and enter the energy market is artificially small for this reason. If whale oil had still been cheap in 1870, the oil age would undoubtedly have been delayed. Allowing cheap fossil fuels to persist is delaying a shift to clean energy.

Countries such as Germany and

“ *EU's cap and trade system have largely failed to put the correct cost on climate change* ”



Double double oil in trouble?

Denmark have tried to stimulate innovation and investment in the green sector by handing out subsidies. Aside from being expensive, subsidies force governments to make choices between differing technologies. A subsidy for every windmill built does nothing for the development of solar cells. Given the uncertainty involved with fledgling technologies, the potential for misallocation of resources is immense. Aside from direct misallocation, badly designed subsidies may actually stifle innovation. Subsidies are often set with a particular political goal in mind, such as promising to build a new park of windmills, or have a particular number of households install solar cells on their roof. As commendable as this may sound, it directs resources towards production of current technologies at the expense of encouraging innovation.

We need to shift our strategy and make large-scale private investment in green technologies, which is worth the risk by making the payoffs of success very large. The global electricity market had estimated revenues of 1.8 trillion dollars in 2012. That represents nearly three quarters of total UK GDP just in electricity.

Clearly the size of the pie is enormous - we just need to give innovators a reasonable prospect of capturing a slice. The prospects of large profits will attract capital, despite the uncertainty involved with investing in research and development with unproven technology. With a sufficiently high fossil fuel price, private firms will be able to ex-

“ Setting high fossil fuel prices not only reduces the amount of fuel burned; but also increases the speed at which alternative energy is developed ”

tract rents from any successful green technology, unlike the government. For this reason, private green investment will far outstrip the current levels

of public green investment. A further benefit of private green investment is that it eliminates the aforementioned choice that government subsidies face. As long as a technology has the potential of competing with fossil fuels and grabbing some market share, private capital will flow towards it. Allowing energy firms to compete on a social cost basis will let the market decide what the optimal balance between green technologies is. Given strong competition, there is every reason to suspect this ‘market’ mix of technologies will be more efficient than a ‘planned’ outcome achieved through heavy government subsidy.

Our best shot at avoiding the drastic climate change that will likely accompany the business as usual scenario is to use the market to our advantage. Setting high fossil fuel prices not only reduces the amount of fuel burned; but it will also increase the speed at which alternative energy is developed. High fuel prices undoubtedly hurt households and

the economy. However, this effect can potentially be significantly reduced if the government redistributes the fossil fuel tax receipts in the form of, for example, lower income taxes. This would alleviate the negative income effect but maintain the high incentives to innovate. The only way to maintain our current energy intensive lifestyles will be to develop the technology that can produce energy and the infrastructure and market model to distribute it. It’s impossible to say which technology mix will eventually wean us of our fossil fuel addiction. Perhaps the world will only go cold turkey when its reserves have been exhausted. The most efficient and powerful mechanism we have to organize ourselves is the market - surely we need to use it to tackle climate change as well. I for one am hopeful that given the right incentives, a modern day environmental Rockefeller will emerge to knock Bill Gates of his perch. ■



The tide is turning.



MANAGING SCARCE RESOURCES

SPECTRUM: THE INVISIBLE EMPIRE

By Sugandha Srivastav

The development of wireless communications was a great turn for human civilisation. Guglielmo Marconi developed the radiotelegraph to transmit signals across the Atlantic in the 19th century. This set the stage for the digital revolution of the coming two centuries. It heralded the humble beginnings of spectrum – a natural resource that would become the backbone on which information sharing, innovation, scientific advancement and social networking would flourish. In the words of the American inventor, Lee De Forest, ‘an Invisible Empire, intangible yet as solid as granite’ had been discovered.

Spectrum is a natural resource whose utility can only truly be appreciated if it were to be disrupted. Imagine if wireless communication suddenly stopped. Mobile phones would stop working, communication to airplanes would halt, nation-

al defense programs would collapse and global supply chains would

“ *Spectrum is a natural resource whose utility can only truly be appreciated if it were to be disrupted* ”

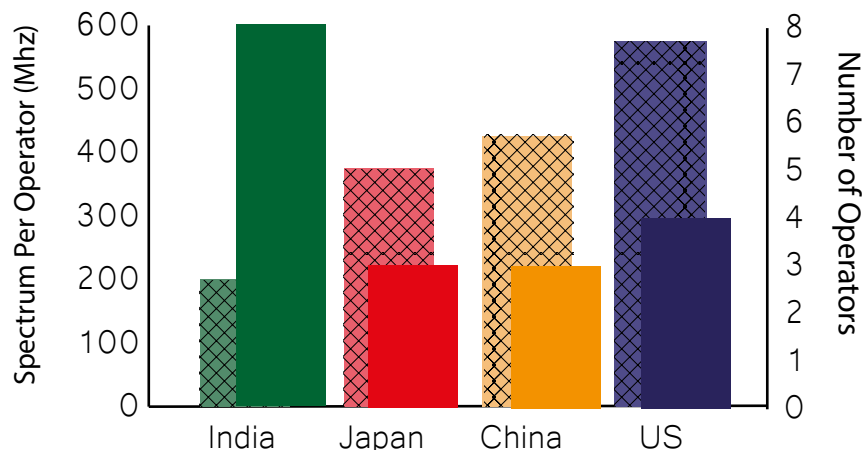
breakdown. The world would come to a stand-still. Spectrum is the invisible resource that keeps information flowing and which keeps the cogs of the economy turning.

However, as the world enters into a stage of hyper-connectivity where phrases like 'big data' and 'the Internet of Things' become commonplace, the demand for spectrum will increase rapidly. From its abundant manna-like origins, spectrum is now perceived as scarce. Telecom operators compete aggressively for limited bandwidth. Spectrum scarcity necessitates efficient economic management. However, it is different from other market goods in that some bands (ie wavelengths) of spectrum are more highly valued than others, due to their physical properties. Longer wavelength bands tend to have greater range and higher penetrability through physical objects, which means mobile network operators save money on building up network infrastructure. Market-based mechanisms such as auctions and trading can efficiently allocate commercially-used spectrum.

In 1994, the Federal Communications Commission made a transition from 'beauty-to-bidding'.

It shifted from the 'beauty contest' method of allocating spectrum licenses to its first auction. Governments realised that spectrum auctions could fill their coffers with tens of billions of dollars. By putting their 'money where their mouth was', telecom operators spoke more truthfully about how they valued the resource. This is, in turn, led to a more efficient allocation of

National Spectrum Capacities



spectrum bands. While spectrum auctions have become common practice, their designs remain hotly debated.

The United Kingdom has pioneered the use of the combinatorial clock auction to allocate spectrum. This is a multi-item auction in which spectrum is categorised into discrete units. Bidders choose bundles of discrete units and state the price they are willing to pay for each unit. Once the most valuable bundles have been determined, the clock phase commences. In this phase, the price of each bundle starts rising until only one telecom operator is willing to buy it. The license is allocated to that operator.

Combinatorial auctions have been

praised for their ability to capture synergies. For example, owning the license to provide telecom services to two metropolitan cities such as Delhi and Mumbai is worth much more than the sum of serving these cities independently. Likewise, different bands of spectrum come with technological complementarities. This makes the combinatorial auction attractive alternative to the simultaneous ascending auction as it allows optimal bundles to be formed endogenously.

Secondary trading is another mechanism that can enhance efficiency in allocating spectrum. Radio spectrum licenses are allocated for fixed periods of time - often for 10-15 years. How-



BT phone home



ever, in this time, technological developments and/or changing market conditions could mean that it is no longer efficient for a telecom operator to hold a particular license. Secondary trading would allow telecom operators to buy and sell spectrum licenses to each other as and when required. This would help remove barriers to entry by allowing operators to acquire rights of use more readily and promote market competition. It would increase flexibility in the market which would help telecom operators respond to changing demand conditions. However, economists have argued that liberalising spectrum through secondary trading would affect bidding strategies in ways that would be unpredictable and could further complicate auction design. Countries have cautiously adopted secondary trading. Currently, secondary trading is legal in the United States, United Kingdom and parts of the European Union. It is being considered by developing nations such as India.

Finally, regulators must take the

market structure into account. While competition has its benefits, hyper-competition in the wireless industry can be damaging. Each telecom service provider needs to hold a critical mass of spectrum to operate

“ While competition has its benefits, hypercompetition in the wireless industry can be damaging ”

efficiently. In most countries there are 3-4 telecom service providers in the industry. However, in India there are 8. This means Indian telecom operators have very low average revenue per user. This is a problem because the telecommunications industry requires large infrastructure investments. Such investments cannot be possible if average revenue is close to rock-bottom.

In India the issue is particularly vexing as telecom infrastructure is viewed as a critical component of the country's development agenda.

Auction theorist Paul Milgrom noted that spectrum ‘piqued the interest of academic economists because its auction design made detailed use of the ideas of economic theory and the recommendations of economic theorists.’ In Milgrom's words, ‘economic analysis dictated nearly all the rules in the first few auctions.’ The situation is hardly different today. Spectrum is one of those raw fields where fundamental insights from game theory and regulatory economics can be applied and tested directly. In the current period when data-demand is reaching new heights, spectrum scarcity once again necessitates the use of sound economics. With Malthus' spectre looming in the shadows, it is an interesting time to rekindle interest in how to manage this scarce, invisible but profoundly important resource. ■

TO SCALP OR NOT TO SCALP: LESSONS FROM TICKET RESELLING

By Ole Agersnap

If you ask a random person and an economist what they think of ticket scalping, chances are you will get two very different answers. Most people have experienced the disappointment of just missing out on getting tickets to a concert or sports match that they desperately wanted to go to. Later, they may find scalpers selling tickets online or outside the venue at up to ten times their original price, and the unlucky fans are likely to get angry. “Blood-suckers”, they may think to themselves, “taking advantage of others for their own profit”. Whether or not the fan actually chooses to buy the ticket, the lasting impression of the ticket scalper is decidedly negative.

A typical economist would think of this completely differently. Ticket scalpers may be doing it for personal gain, but in doing so, they are also correcting a market failure. When an event sells out fast, it’s because the demand for tickets is higher than the supply, which leads to inefficiency: the people who end up getting the tickets may not be the ones who derive

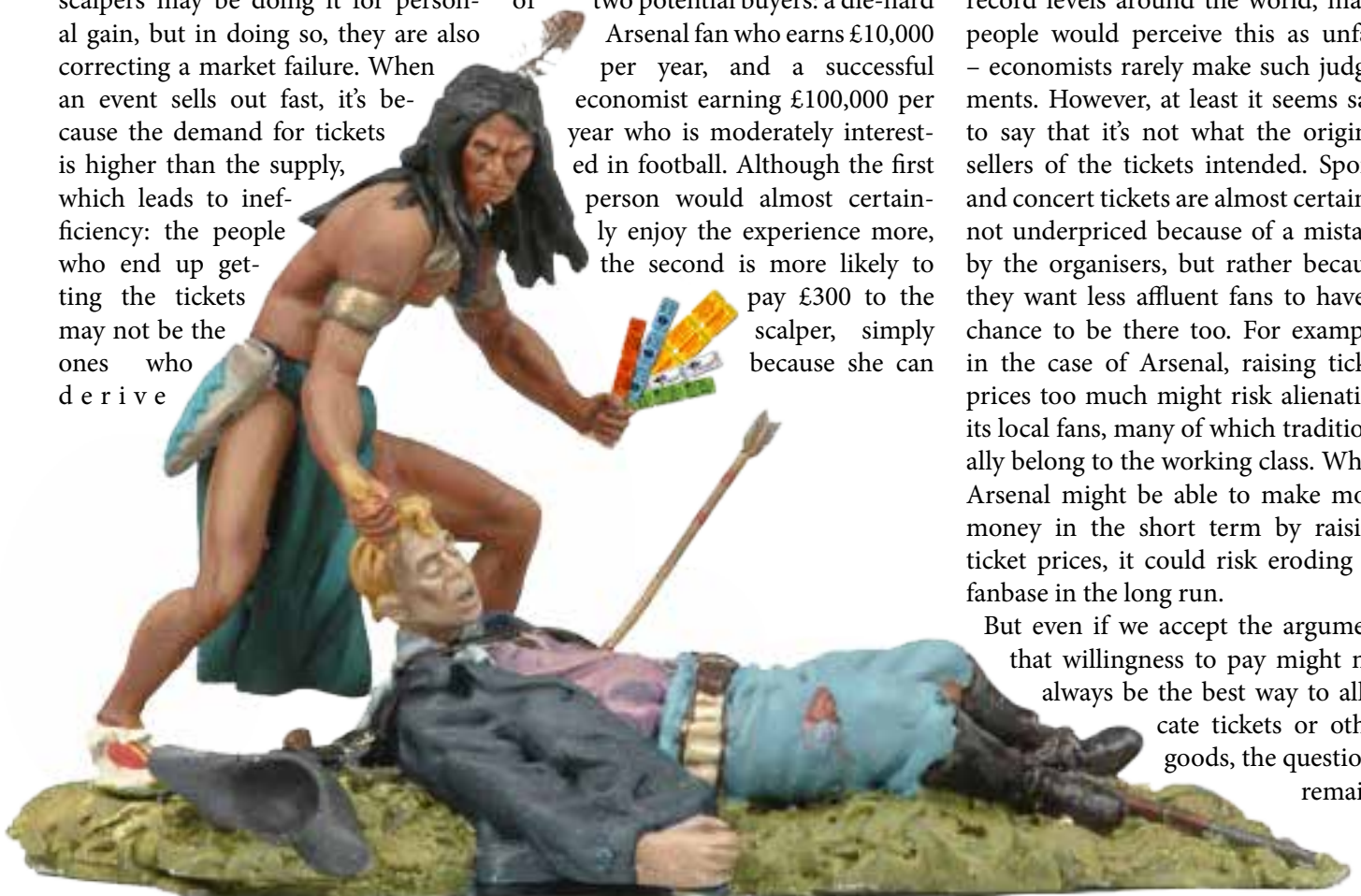
the highest utility from attending the event. Therefore ticket scalpers are just increasing total welfare: they are only able to sell tickets at a price of £300 if someone actually values the ticket higher and is willing to buy it at this price. The deal between the scalper and the buyer must leave everyone better off. Thus, according to the economist, the ticket scalper simply earns his profit from the socially beneficial task of distributing the tickets to those who would enjoy the event the most: the people with the highest willingness to pay.

But how well does the willingness to pay really measure the utility that a person derives from going to a concert or a sports match? Imagine a scalper selling a Premier League ticket to one of two potential buyers: a die-hard Arsenal fan who earns £10,000 per year, and a successful economist earning £100,000 per year who is moderately interested in football. Although the first person would almost certainly enjoy the experience more, the second is more likely to pay £300 to the scalper, simply because she can

afford it easily, whereas £300 corresponds to nearly half of the Arsenal fan’s monthly disposable income. This illustrates the problem with using willingness to pay as a utility measure - It is to a large extent influenced by the ability to pay. Trying to maximise social welfare by allocating tickets to those who are most willing to pay will result in a bias where the utility of those with the highest incomes is assigned a disproportionately large weight.

This may also explain the distaste that many people feel towards ticket scalpers. Taking the preceding argument to its extreme, scalpers are taking away tickets that could have gone to the poor and selling them to the rich, earning a profit in the process themselves. In a time where inequality is reaching record levels around the world, many people would perceive this as unfair - economists rarely make such judgments. However, at least it seems safe to say that it’s not what the original sellers of the tickets intended. Sports and concert tickets are almost certainly not underpriced because of a mistake by the organisers, but rather because they want less affluent fans to have a chance to be there too. For example, in the case of Arsenal, raising ticket prices too much might risk alienating its local fans, many of which traditionally belong to the working class. While Arsenal might be able to make more money in the short term by raising ticket prices, it could risk eroding its fanbase in the long run.

But even if we accept the argument that willingness to pay might not always be the best way to allocate tickets or other goods, the question remains



Scalping with the Stars

how to find the best allocation and how to enforce it. There is probably no universal answer. In the case of many sports clubs and some musicians, a certain number of tickets are given or sold cheaply to members of fan clubs. Premier League clubs offer season tickets for which the price per match is much lower than the price of a single ticket. This enables clubs to reward their most loyal fans while avoiding the problem of tickets being resold at higher prices.

Another method could be to use “willingness to wait” as a measure of how dedicated fans are, rather than willingness to pay. Traditionally, many fans have camped out, sometimes for days, to be certain to get concert tickets. This allocation method certainly does not favour the rich, but it might be problematic in other ways – for example, it is biased against those without much free time, such as single parents. And it might be ineffective too.

“ Even when markets are not the best way to allocate goods, the cost of getting rid of them may be too high to bear ”

Today, as fewer tickets are sold in actual stores and more online, the willingness to wait doesn't really apply since getting a hold of scarce tickets is more a question of luck: refreshing the website at exactly the right time and hoping that you're one of the few who manage to get through to buy a ticket. This applies to fans as well as scalpers. And simply prohibiting scalping, as many countries have done, is unlikely to change anything. The internet provides so many sites for buying and selling that a ban would be very expensive to enforce. Even when markets are not the best way to allocate goods, the costs of getting rid of them may be too high to bear. ■

Editors' Review

YES, IT IS A CURSE POLITICS AND THE ADVERSE IMPACT OF NATURAL RESOURCES

By Honglin Jiang



The Norman Sosnow Chair Inaugural Lecture presented by Professor Francesco Caselli on 4 March, 2015

In his inaugural lecture as the Norman Sosnow Professor of Economics, prof. Francesco Caselli chose to address recent developments in the field of natural resource economics and econometrics. He noted how traditional cross-sectional studies relating development outcomes to resource endowments are too simplistic for establishing causality, and how new techniques are being brought to bear on the problem. Unfortunately, the evidence is conclusive, as the title of his lecture establishes: natural resources are indeed a curse. Not in the conventional economical sense, where high commodity prices crowd out other sectors in the economy and lead

to an uncompetitive exchange rate (Dutch disease), but in the political sense, where the result is corruption, war and autocracy.

Whereas previously many studies highlighted correlations between, say, corruption and natural resource endowments across a number of countries, the key idea behind recent methodology has been to explore the effect of natural resource endowments within countries. This controls for many confounding factors that could interfere with the desired result, such as differing histories, cultures, institutions and geography.

One such study looked at municipalities in Brazil, only some of which derive revenues from

oil fields in their area, which they are entitled to according to the Brazilian constitution. The study found that, after controlling for other variables, the oil-endowed municipalities spent more in their budget on public works without actually building more public works than their oil-less peers. Caselli concluded that the money was likely being embezzled, or had found its way to other unsavoury ends. Furthermore, an analysis of Brazilian news stories showed that stories with keywords such as “corruption” were significantly more likely to be paired with the names of oil-endowed municipalities than those without oil.

Another study looked at how countries’ politics changed over time after a price change in their principal resource. The authors found that, if the country was already somewhat autocratic, a commodity price boom leads to a significant deterioration in the country’s politics, as measured by a “democracy index”. In other words, mild autocrats exploited the opportunities their newfound resource wealth gave them to consolidate their grip on power and crush dissent. For countries that were already democratic, however, the effect was much more benign.

For troubled regions rich in resources, the human toll is not limited to suffering under a despot, but also civil conflicts. Another study found that relative to baseline scenarios, countries that discovered significant oil deposits had a much higher likelihood of becoming embroiled in a civil war after a lag of 4-6 years. Furthermore, another study focusing on Colombia found that clashes between government forces and the FARC rebels intensified with the price of oil in regions endowed with oil, while those without oil saw no significant change.

Unfortunately, conflicts over natural resources do not seem to be limited by national borders either. Another

paper examined the endowment and proximity of resources to borders between two neighbouring countries,

run and thriving resource-poor states abound - Singapore and Hong Kong spring immediately to mind. However, clean and prosperous countries with natural resources do exist, a paradox that Caselli referred to as the “Norway Question”. By investing its oil wealth across the world and putting its sovereign wealth fund beyond the reach of its politicians, Norway has made its natural resource endowment into a benefit for its society, not a curse. Other countries like Canada and Australia have also managed to avoid recklessly squandering their resource endowments.

Why aren’t more countries like Norway? How can countries escape the curse? These are open research questions without easy answers. More innovative methodology and new data will inevitably be brought to bear on this rich field of study. In the meantime, we can only hope that the recent fall in commodity prices will alleviate some of the ills wrought by the curse. For some, such as Venezuela, a reversal of the disastrous economic policies wreaking havoc on its population cannot come soon enough. ■

“ *The key idea behind recent methodology has been to explore the effect of natural resource endowments within countries* ”

and their effects on the relative risk of war. The hypothesis here is that a country with a natural resource deposit close to a border with a resource-poor nation is at a higher risk of conflict than if the resources were far away from the border, or if they both were unendowed. Indeed, the data showed that resources near the border made it three times more likely for the countries to go to war.

Thus, the evidence seems compelling. Corruption, autocracy, civil and international wars all curse the countries unlucky enough to possess natural resources. Conversely, examples of well-



Rebels with a cause



PREVENTING COLLAPSE SAVING THE WORLD'S FISHERIES

By Matthieu Glotz

500 million human beings currently depend on fishing to sustain their livelihoods, most of them live in developing countries. Given that 25 percent of the world's fisheries are on the brink of depletion, the future of this resource seems bleak and, along with it so does the future of the individuals who depend on fisheries for their survival.

The threat to fish stocks is a case of market failure. Since it is difficult to enforce property rights on wild fish, individuals capture the fish and sell them to derive economic value. In doing this, individuals seldom think about the fact that each fish killed diminishes the potential of the entire fishery. This negative externality threatens production and could eventually lead to resource depletion (a phenomenon known as the tragedy of the commons).

To address this market failure, governments use two main tools. The first restricts the amount of fish fisherman can legally catch. This is enforced through net regulation and by reducing the length of the fishing season. The second mechanism is the introduction of Individual Transferable Quotas (ITQs) which are tradable rights on the percentage of fish-catch for a particular fishery. The basic idea of ITQs - also known as catch shares - is to realign individual incentives to social incentives by assigning property rights to living stocks. Once fishermen are allocated with property rights, they have a sense of ownership over the fishery. This leads to a direct incentive to prevent their fishery from collapsing as this would render the future value of their resource to zero. Such schemes were first implemented in Iceland and Canada. Now they cover over 10 percent of the world's fisheries.

There are three main advantages of the ITQ regulation system. First, it allows durable management of the fish stock - there are documented cases of ITQs reversing the rate of decline in some fisheries. ITQs also tend to reduce bycatch and mortality rates. Secondly, evidence suggests ITQs increase fishermen's living standards by ensuring a higher price for their

catch thanks to reduced production. Lastly, the fact that ITQs are tradable allows the allocation of the rights to the most efficient fishermen.

However, while ITQs achieve the stated objectives, an important question is how they compare to other forms of regulation. A vexing issue is how to initially distribute property rights. There have also been blips: an emblematic case is the introduction of the American ITQ system, which freely distributed fishing rights that are valued at 345 million dollars today. Moreover, ITQs favour oligopolisation: 8 companies own 80 percent of the New Zealand fishing quotas, all species included, and 4 companies share the market for Alaska's crab. The concentration of ownership in the hands of a few actors has had disastrous social consequences for coastal fishing communities. For these communities, ITQs may put an end to an entire way of life and model of economic organisation. This social externality is already an important problem for developed countries, but might yield even worse outcomes in developing countries, which offer little safety nets or alternative economic activities for their fishermen.

To conclude, ITQs, once celebrated as a miracle panacea to the collapse of the world's fisheries, are to be considered with caution. Economists traditionally favour cap and trade systems such as ITQs over direct regulation of production. In the case of the fishing industry, however, the issue is more nuanced. While the economic efficiency of ITQs is advantageous, ITQs also come with their share of social consequences. Human coastal communities are a component of developing societies. For political economy reasons, one could question a policy that potentially leaves them worse-off. Every policy has trade-offs: the question is whether ITQs are the best method to save our fisheries while minimising the number of people who are worse-off due the policy. When economics meets darwinism, there is no free lunch. ■

A CALL FOR A NEW WORLD ORDER – THE INTERNATIONAL ALLOCATION OF NATURAL RESOURCES



UNarrested Development

In 1962, the UN General Assembly passed its prominent Resolution on the Permanent Sovereignty over Natural Resources (PSNR). The resolution was considered a breakthrough for newly independent developing countries that sought to claim complete and permanent sovereignty over their natural resources – regardless of any arrangements made by previous colonial administrations. Nevertheless, the resolution left an open question of how

to manage transboundary natural resources under principles of sovereignty.

To date, a unified doctrine has not yet been developed to deal with issues of shared natural resources within an international legal context. Latest attempts by the UN International Law Commission have succeeded in adopting draft articles on the Law of Transboundary Aquifers in its 60th session, in 2008. The document was discussed further at subsequent sessions; most

recently at the 68th session, in 2013, where several countries expressed concerns that the elaboration of the document as a legally binding instrument was “premature”. It is also worth mentioning that the International Law Commission has decided in its sixty-second session in 2010, not to proceed further with aspects of transboundary oil and gas due to the political sensitivity and technical difficulty involved in oil and gas issues.

Given the complexity of the subject matter, it is worthwhile examining some of the widespread approaches to natural resource allocation from both legal and economic perspectives. This article summarises the major legal arguments regarding natural resource allocation as presented by Richard Bilder (1980) and extends the analysis by referring to relevant public economic arguments.

From a legal perspective, there are three main approaches to natural resource allocation. The most significant of such approaches is the principle that a nation may acquire exclusive authority over natural resources within its legal boundaries. In fact, PSNR is considered one of the most important applications of this principle. Over the time, however, the scope of this principle has been extended to include economically valuable resources in the seas adjacent to coastal states. In 1982, for instance, the UN Convention on the Law of the Sea adopted its revolutionary provision of allotting nations 200-mile Exclusive Economic Zones in the oceans. This allocation of resources (or more precisely “ownership” of resources) to various nations is argued to set the stage for international trade and cooperation.

In contrast with this presumably well-established approach, comes the

NATURAL RESOURCES

principle that resources should, in effect, be considered a common property that is accessible for all. Historically, the most conspicuous example of the principle of common access has been the doctrine of the high seas. Article 2 of the 1958 Geneva Convention on the High Seas provides in part that: the high seas being open to all nations, no State may validly purport to subject any part of them to its sovereignty. Nevertheless, with succeeding developments, including the 200-mile exclusive economic zones, the concept of the oceans as international commons has all but disappeared.

Finally, a third possible approach is the principle that resources common to more than one nation should be shared by the countries concerned according to equitable standards and procedures. This concept is suggested, for example, in Article 3 of the 1974 United Nations Charter of Economic Rights and Duties of States, which provides that: in the exploitation of natural resources shared by two or more countries, each

state must cooperate on the basis of a system of information and prior consultations in order to achieve optimum use of such resources without causing

under provision of common goods. Arguably, one possible generalization of this analysis on a global level is to say that natural resources should be exploited only under the management of international institutions. This is because such institutions are expected to have the capacity to address issues of negative externalities across countries, meet the international demand for public goods, and abandon any exploitation of monopolistic power by private owners or individual states.

As a matter of fact, interdependence of natural resource management implies that a nation cannot effectively realise its natural resource policies without taking the actions and reactions of other nations into account. Hence, decisions relating to natural resource issues will inevitably have to be conveyed and implemented through international agreements and institutions. ■

“ To date, a unified doctrine has not yet been developed to deal with issues of shared natural resources ”

damage to the legitimate interests of others. The most important application of this concept of joint control is the principle of equitable utilization or apportionment of rivers or lakes that lie within more than one country.

Turning to a public economics perspective on natural resource allocation, it is usually argued that private ownership of natural resources would result in market failure due to imperfect property rights. This argument emphasises the classical problems of inefficient monopolies, negative externalities and



Orcastrated sealions

GREEN BUT GRIDLESS? THE CHALLENGE OF DISTRIBUTED GENERATION

By Christine Farquharson

As spring approaches, students completing assignments on the roof of the Saw Swee Hock building might notice that they are not the only ones soaking up the sun. As part of its sustainability strategy, the new student centre hosts a number of solar panels on its roof.

This is just one example of a broader trend towards the micro-generation of power by individual homes and businesses. Driven by falling costs and aggressive government subsidies, micro-generation has many proponents. However, as with any innovation, it challenges the position of the existing players in the electricity market: power utilities. That, in turn, threatens the traditional model of power generation

and distribution, which has sustained the power grid for the last century.

The industry is aware of the challenges ahead. In 2013, the Edison Electric Institute, an organisation of U.S. power generators, released a working paper on 'Disruptive Challenges' facing the industry. The unusually frank report spoke of the move towards distributed generation as a 'game changer' likely to 'dramatically impact customers, employees, investors, and the availability of capital to fund future investment'.

The concerns are based on the economics of the traditional model for power generation and distribution. The power grid in the U.S. is valued at about

\$875 billion. It connects 3,300 utility companies with 150 million customers and carries \$400 billion-worth of power each year. Over 450,000 miles of high-voltage transmission lines carry electricity from power plants to electrical substations, and another 2.5 million miles of feeder lines connect individual customers to the substations.

Building and maintaining this grid, particularly the transmission network, imposes large fixed costs on utilities. In return for the large infrastructure investment, regulators allow utilities to charge a fixed fee (calculated daily, monthly, or annually) for connection to the grid in addition to charging by



Eternal Sunshine in Gridless Times

kilowatt hour of power use. This two-tiered pricing scheme is designed to preserve incentives for conservation while recognising the fixed costs faced by utilities and providing them with a reliable source of revenue to facilitate investment in the grid.

However, distributed generation could undermine this model. As solar panels and wind turbines become cheaper and government incentives more tempting, households and businesses are increasingly opting to generate power themselves. This challenges the traditional notion of the grid as a machine to take centrally-produced power and distribute it to a network of customers. Instead, the grid must be more flexible, distributing power not just to households but also between them.

Industry players are concerned that this degree of flexibility may be out of reach for traditional utilities operating under traditional pricing structures. Anthony Early Jr., the CEO of American energy giant Pacific Gas & Electric, cautions that ‘no less than the stability of the grid is at stake’ from increased individual power generation. An analysis by Navigant Research predicts that revenues from solar installation will rise 44 percent by 2018, meaning utilities must be prepared to see ‘a different model emerge’.

A key concern is the possibility of a ‘death spiral’: customers reduce the amount of power they buy from the grid, reducing utilities’ revenues. In order to be able to cover the fixed costs of the grid, utilities will raise rates, driving more consumers to turn to home generation and – in the most pessimistic scenario – leading to the collapse of the traditional model.

Collapse is a concern because the grid is largely a fixed cost. When a customer disconnects, the costs to the utility change only a little; the utility saves only the cost of maintaining the line required to connect that household to the nearest feeder line, which is typically a negligible portion of the overall costs.

However, the utility loses the entire flat fee paid by the disconnected customer, raising average costs for all other consumers.

But are customers actually likely to disconnect entirely? Although anecdotes of businesses becoming energy

sumption, the grid is able to support these spikes in individual consumption much more easily.

Finally, the economic case for a household to install a wind turbine or a solar panel frequently rests on the ability to sell excess power back to the grid. This is underpinned by government incentives such as feed-in tariffs, which offer high prices – often in excess of 10 times market rates – to households and businesses that generate power and sell it back to the grid.

Even if distributed generation does not lead to a mass exodus from the grid, it is likely that price incentives will need to adapt in order

“ *Households and businesses are increasingly opting to generate power themselves* ”

self-sufficient, disconnecting is not a reasonable option for most customers for three reasons. First, it is difficult to overstate how important electricity is to households and businesses. Power cuts cost American businesses roughly \$150 billion a year, and their effects on household welfare could be even larger. Customers are therefore very sensitive to risks to their power supply. Although renewable energy technology is improving, as are options for storing generated power for later use, customers are likely to prefer to remain connected to the grid ‘just in case’ for the foreseeable future.

Using the grid to backstop electricity consumption is particularly important because households’ power consumption is not smooth. In addition to peak consumption times in the mornings and evenings, individual appliances also have different power needs over time. For example, starting an air conditioner can require a five-second burst of 10 times as much power as is needed to keep the air conditioner running afterwards. In order to meet this level of demand through distributed generation, either a household must build generation capacity several orders of magnitude in excess of its ordinary needs, or it must invest in industrial-scale power storage technology. Because it aggregates power con-

sumption, the grid is able to support these spikes in individual consumption much more easily. Currently, many utilities’ pricing schemes involve cross-subsidisation: consumers pay a larger charge per kilowatt hour, some of which subsidise utilities’ infrastructure costs. Redesigning pricing systems could eliminate this problem and better align customer incentives with company costs.

Regulators should also consider how to treat businesses and households with generating capacity – are they consumers or producers? Is it sufficient for them to pay the regular connection fee, or should they be forced to negotiate with utilities for the right to distribute their power through the grid?

In its working paper, the Edison Electric Institute is careful not to predict too closely the effects of distributed generation, nor to prescribe too explicitly possible policy solutions. Instead, it serves up a warning of what could happen if utilities fail to respond to the challenges of distributed generation. For an industry that has changed very little in the century since Thomas Edison invented the lightbulb, change may be difficult to embrace; however, it appears that it is becoming ever more necessary. ■



ECONOMICS, ENTREPRENEURSHIP, AND THE ENVIRONMENT: INTERVIEW WITH GEORGE BAKER

By Melanie Friedrichs

A Problem of Storage

“You see, the deep and important truth about electricity is that it is unstoreable”, says George Baker, a Harvard Business School (HBS) economist and founder and CEO of VCharge, a small startup with big ideas about the market for electricity. “And what this means is that the price of electricity varies fantastically over the course of the day - by a factor of three”.

It’s a sunny morning in March and I’m standing in an apartment on the 12th floor of Hide Tower, a utilitarian concrete block rising above the row houses of Pimlico in south central London. The apartment is strewn with toolboxes and cable; another VCharge employee is laying a wire in the hallway. London stretches south through the window, the

Battersea power plant dominating the skyline.

“What if I told you that wheat was worth twice as much at night as it is now?” Baker asks. You would buy it now and sell it then! You could easily arbitrage. Unpredictability can be a problem, but electricity is predictable. In fact it’s going to go up and down twice every day: low at midnight, up for the coffee pot peak in the morning, low at lunch, and up for the television peak around 6 or 7 at night”. He draws out the curve in the air, a long sideways ‘S’.

“Batteries can store electricity but they can only store it at fabulous cost. If you go and buy yourself a battery, and assume that you could make that arbitrage profit every single day, the payback would still be about ten years — and

your battery would wear out after five”.

Lack of storage means that price must vary with demand, Baker explains, but almost everywhere the hourly price of electricity is fixed. A fixed price means consumers have to worry about electricity less, but it also means they have to pay more in the end. “If an airline told you that you can fly to Chicago for one price, it doesn’t matter if it’s Christmas weekend or the middle of February, what premium do you think you would have to pay? Your freedom to not think about what you’re consuming is not free; it’s actually pretty expensive. Someone else has to absorb all that risk and volatility”.

He points out a device on the wall, a narrow box about waist high, painted a bland off-white to blend into the back-

ground. It's a heater, the type of object that I'm so used to ignoring I actually have trouble noticing it. Baker explains that the box is full of ceramic bricks which, when heated with electricity, can store that heat for up to half a day. They were installed in buildings like these en masse in the 1970s.

This box is the heart and soul of Baker's company, and one possible solution for the electricity storage problem. The small vent on the top has been fitted with a smaller black box with the VCharge logo, and a couple of loose wires running to one side. When the black box is operating, VCharge's algorithms will automatically open and close the vent in response to spot energy prices, effectively adjusting the device's energy demand. When adjusting thousands of heaters at once, VCharge can essentially act like a high-frequency trader for the electricity grid.

Because energy can't easily be transferred out of the heaters, VCharge isn't a perfect solution for the storage problem, Baker admits, but it does alleviate the problem. "We are storing electricity only in a certain sense. We can't sell it, but we can deliver services with it. Right now, at this hour, electricity is expensive, but these bricks are perfectly hot".

From Harvard to Hide Tower

Baker started his career in business, but after a few years returned to Harvard for a PhD in economics, and stayed to teach at the Harvard Business School. In 2007, after more than 20 years at HBS, he took a sabbatical to study the market for renewable energy on an island off the coast of Maine.

"Up in Maine the wind blows all the time, so the question was, why isn't there wind power? Of course I'm an econo-

mist. There are no \$20 bills lying on the sidewalk; if there were, then someone would have already picked them up. I already kind of knew the answer, which was a sort of deep animosity towards outside capital, so that even though [wind farms] were a good deal, the financing didn't work. But after spending some time looking into the US tax code

sea power plant through the high-rise window, comes in many forms; natural gas, oil (although not much any more), nuclear, hydro, wind, solar. "Load", he says, flipping the light switch in the apartment, "is everything that uses electricity".

The process of matching generation to load is called "grid balancing". Traditionally grid operators have kept the grid in balance by adjusting generation to load. "Energy suppliers have commitments to ramp up and ramp down based on projections of what the load curve is going to look like", Baker says. "They might literally call up a power plant and say, do more or do less".

Supply-side grid balancing is expensive for generators, and that cost is passed through to consumers. Grid balancing is particularly difficult when electricity generation comes from renewable sources, because the grid operator can't control the wind or the sun. Without storage, the only way to respond is

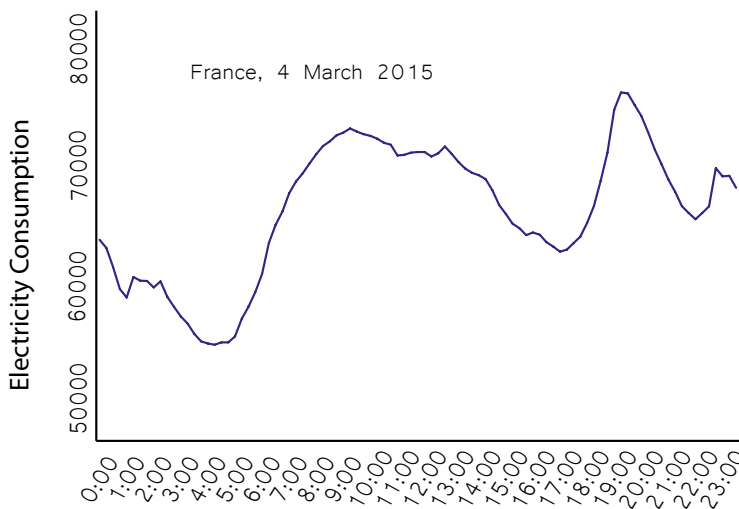
"curtailment": turning off power generation when the wind is blowing too hard or the sun shining too hot.

According to Baker, the only cost effective storage right now is pumped-storage hydroelectricity, or "pump hydro" for short. When electricity is plentiful, water is pumped uphill to a reservoir at a high altitude. When it is scarce, the water is released and electricity is generated from the force of the current.

"Unfortunately there aren't many places in the world where you have reservoirs at the top of mountains", Baker says. "One of the reasons Denmark gets away with [reliance on renewables] is because they have Norway. When the wind is blowing like crazy in Denmark they ship it to Norway and fill up the reservoirs, and when the wind is not blowing they buy it back. Norway is like a giant battery for Danish wind and solar".

VCharge's algorithm-managed "smart-

Daily Load Curve (France, 4 March 2015)



A arbitrage opportunity? Daily fluctuation of electricity consumption.

and various other forms of government subsidies and loans for rural areas, I thought, 'we can actually do this!'"

Baker pulled together the financing and took a second leave to see the project through. Through the project, Baker met Jessica Millar, a mathematician who had also recently left academia to start an energy-related venture. Millar's idea was to take advantage of variability of the price of electricity to charge electric vehicles; she had already written some of the algorithms now at the core of VCharge's product. Millar and Baker wrote a business plan, raised some money, and VCharge was born.

Grid Equilibrium

"Because you can't store electricity the electric grid has to be perfectly balanced", Baker says. "Generation must equal load in every week, in every day, in every hour, in every second". Generation, he explains, pointing to the Batter-

brick” heaters balance the grid by helping solve the storage problem, but they are also doing something more — adjusting load to generation, something known in the industry as “demand response”. “Whenever load exceeds generation, we turn off load; whenever generation exceeds load, we turn on load. And we have extremely precise control; every five minutes we’re updating our view of what to do”.

Economics to Environmentalism

Smartbricks are only one way to confront the energy storage problem. Many environmentalists hope for an imminent breakthrough in battery technology, that by reducing curtailment waste would make renewables more productive and more cost-efficient.

“There are people doing all kinds of wacky things”. Baker comments. “There is a guy who is building essentially a chairlift to carry gravel up a mountain when electricity is cheap and drop it back down when it’s dear. And the reason people are doing all these wacky things is because this daily pattern of prices is unique, and really lucrative if you can find away to arbitrage it. If you’ve got storage it’s like shooting fish in a barrel”.

Technology also has the potential to create additional opportunities for demand response. Smart metres that record household energy consumption in half hour units could match energy use to energy prices, passing price variations through to consumers and incentivising time-conscious energy use. A number of demand response schemes already implemented in the US and the

EU offers rebates to households or offices that reduce energy consumption during predicted peak demand.

The end goal for many in the alternative energy space, of course, is to reduce reliance on fossil fuels. Grid balancing, either through storage or demand response, addresses this issue by allowing generators to supply energy more efficiently and by minimizing curtailment, while at the same time reducing the price of energy. Direct improvements to renewable or other types of electricity generation is another, complementary method. A third, but unfortunately not always complementary approach aims to cut fossil fuel use through improvements in energy efficiency.

“Heat pumps, for example, use only about a quarter of the energy required by a standard resistive heater, but you have to run it basically all the time, so you can’t be picky about when to buy”, Baker says. “Efficient use of the electric grid requires that we understand the time-varying nature of the problem. Efficiency has to be thought of not as just ‘use less,’ but ‘use it at good times,’ because there are always going to be times when there is spare electricity, especially as we rely more on renewables”.

Academia vs. Entrepreneurship


The transition from academia to entrepreneurship has advantages and disadvantages, Baker notes. “One of the things that never, ever, ever happens in economics, even in academic administration, is the phone rings, you pick it up, and you make a decision. Everything can wait. There’s not this sort of urgency or value placed on being reasonably

good at getting things to happen or getting things done”.

“In business no one ever has time to sit around and really think about a problem”, he continues. “As an academic, you choose a problem, and if it takes you three years to solve it then that’s OK. One of the things that’s great about VCharge is that we have a team that’s smart and thoughtful, and every once in a while we do sit down and have an academic discussion about the right way to solve a problem. As a result I think we have a product that is very robust in its structure”.

Entrepreneurship isn’t always easy, he adds. When Baker and Millar met in 2008, energy prices were high and many investors were interested in the energy space, but the dramatic drop in US natural gas prices due to fracking has made VCharge a harder sell. Changes in macroeconomic factors and the electricity market structure have made VCharge’s vision easier to implement. Baker and Millar expanded from their original geographic base in the US states of Pennsylvania and Maine to Ireland and the UK in 2013. “I’m having a good time, but I’m working harder than I have ever, ever, worked”, Baker notes. “Even when I was a struggling associate professor trying to get tenure”.

And the end takeaway? “In my view the real tension is exactly this question of depth and speed. How often do you decide that you really want to understand something, and how often do you just say ‘time to cut down this tree and plant the next one’ ?” ■



“ Whenever load exceeds generation, we turn off load; whenever generation exceeds load, we turn on load. And we have extremely precise control ”



2015: YEAR OF THE TIGER? WHY INDIA MAY SURPASS CHINA AS THE WORLD LEADER IN GROWTH

By Navreen Sandhu

The onset of the financial crisis was, for many, the time for emerging market economies to take the driving seat in fuelling global growth. Despite 2014 seeing many developed economies slowly emerge from the crisis, BRIC activity was disappointing, and this trend is set to continue throughout 2015: China is facing a slowdown in growth, the Brazilian economy has become entangled with the costs of stagnation, and Russia is in recession, hurt by costly sanctions and tumbling oil prices.

But one BRIC economy remains a beacon of hope for global growth. Recently revised GDP figures show that the Indian economy grew by 7.5% in the fourth quarter of 2014, allowing it to overtake China as the fastest growing large economy. This came as a surprise

to many economists, with most predicting that India would not pull ahead until at least 2016.

With the title of the fastest growing economy comes an increasing level of scrutiny. Sceptics have been quick to point out that the difference in growth figures is marginal, and one quarter of higher growth does not necessarily mean that India will go on to become the symbol for emerging market prosperity. Furthermore, the strong growth figure for 2013/14 (revised upwards from 4.7% to 6.9%) was mostly due to a rebasing of GDP figures, with the base year adjusted from 2004/05 to 2011/12 to improve accuracy; in addition, for the first time it included private corporate performance and sales and service taxes. A strong GDP figure for the previous year

is surprising given economic indicators, such as low tax revenue and weak credit demand, although when the effects of the falling price of oil (India imports 80% of its oil unlike Brazil and Russia) and the adjustment in calculation method are considered, the annual and Q4 GDP figures are less astounding.

Real GDP growth is set to increase further in 2014/15, with many economists now predicting an annual growth rate of 7.4-7.8%, representing a mark-up of at least 0.5% on last year. Lower commodity prices will again factor into the equation. Additionally, the Reserve Bank of India has cut interest rates in response to falling inflation. With further rate cuts on the horizon, economic activity is set to rise.

However, despite the positive outlook for India over the coming year, whether its economy will drive global growth for the next few years as China has throughout the previous decades largely rests on the ability of the government, and in particular the finance minister Arun Jaitley, to push through a reformist budget on February 28th. India has always had the capacity to match China, but has been held back by corruption and anti-productivity policies. It now has the base to enact

political reform. To reach its potential, the central bank must continue to ensure monetary stability, whilst the government must ensure fiscal discipline.

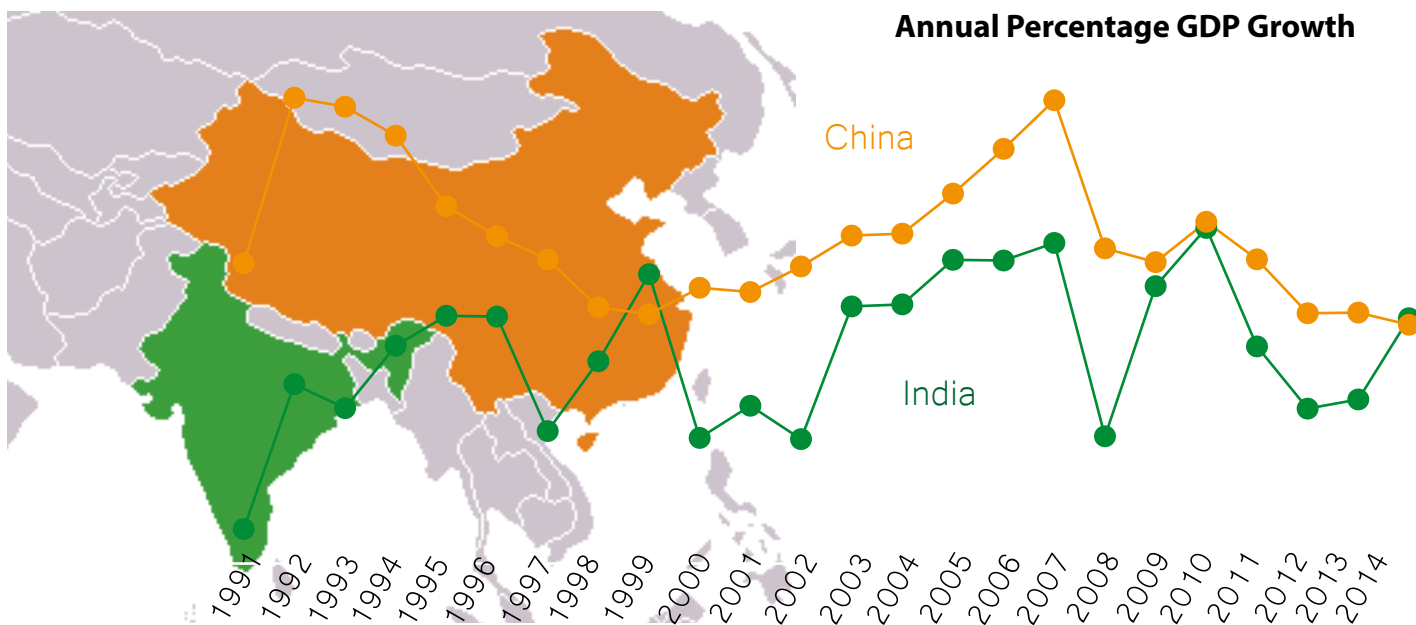
The key to unlocking the Indian econ-

“ The key to unlocking the Indian economy’s success will be to cut through the red-tape and bureaucracy, and deal with corruption ”

omy’s success will be to cut through the red-tape and bureaucracy in addition to dealing with corruption. The complexity of labour laws mean that large firms employ many workers on a temporary basis and smaller firms decide not to expand in order to avoid regulation. Today less than 15% of Indian workers have legal job security. In order to overcome this, the government must act to simplify the law, and could also introduce contracts that both reduce costs of firing employees and also give greater security to workers, thereby creating a more dynamic and efficient labour market.

Furthermore, despite having an outstanding IT-services industry, there are still many areas of the economy that are severely underdeveloped. A large number of businesses are affected by inefficiency in the power network, with approximately half of businesses suffering from power cuts of at least 5 hours per week. A solution in the upcoming budget could be to allow greater competition in the energy sector, which would in theory result in more reliable power.

This is not the first time that a radical budget has been needed in India. In 1991, the government passed a budget that opened the Indian economy up to the rest of the world, allowing for an increase in trade and foreign direct investment. The newly elected government has a near perfect platform from which to push through the reform that is needed to power India past China. However, it is a very real possibility that recent improvements in GDP will result in complacency and a lack of action by the Modi administration. The combination of lower oil prices and falling inflation means that India could finally reach its potential, and perhaps the Indian tiger will surpass the Chinese dragon. ■



FINANCIAL CRISIS OR LEGITIMISATION CRISIS? THE POST CRISIS REGULATORY AGENDA

By Roberto Formenti

In 2010 academic John Coffee observed that, in the years immediately following a financial crisis, regulators exercise stricter scrutiny and produce tougher regulation. Subsequently, as the economy becomes more stable, regulatory oversight reverts. He called this pattern of heavier and lighter regulation the 'sine curve of regulatory activism'.

Can the post-crisis regulatory agenda be read according to this notion? Or does it hold a more profound meaning?

A Different Approach

The financial crisis that emerged in 2007 from the US subprime mortgage market rapidly affected the banking system, the stock market and all financial institutions worldwide, nearly causing a collapse of the entire financial system. This, in turn, resulted in a severe credit crunch and a contraction of the global economy, whose repercussions are still felt today.

The increased interconnectedness of the global economy helped create the unprecedented scale of the crisis. These wide-reaching effects prompted a general call by civil society, academics, and politicians for radical regulatory intervention.

The most recent intervention has mainly come under the name of Basel III, a new regulatory framework developed by the Bank for International Settlements.

Basel III expresses the post-crisis regulatory agenda and concentrates on what are perceived as the major failures of pre-crisis regulation. The US Dodd-Frank Act and the European Capital Requirements Directive represent the translation of its content in the two most important financial leg-

TENETS OF THE NEW ORDER:



Increase oversight of systemically important financial institutions



Create counter cyclical capital buffers



Reconsider liquidity risk



Revise the leverage ratio



Address the conflict of interest of credit rating agencies



Regulate derivatives trading



Revise top manager remuneration schemes to respond to long-term risk

islations.

The measures proposed by the post-crisis agenda represent the adoption of a systemic approach in conceiving and implementing financial regulation. Such an approach stresses the importance of maintaining a focus on the soundness of the overall financial system. It conceives single institutions and their activities as interconnected and treats them according to their systemic relevance.

By contrast, the pre-crisis regulatory agenda explicitly adopted a prudential approach to financial regulation. Prudential regulation is about the safety and soundness of financial institutions vis-à-vis consumer protection, its main purposes being to constrain monopolies, prevent distortion of competition and protect investors. The focus is on individual institutions and

products, in order to remove those impediments that might produce inefficient or illiquid markets.

It then seems that the financial crisis has resulted in a change of rationale behind regulation: not tougher regulation, but different regulation.

A Challenge to Traditional Economic Assumptions

But what are the implications of a change in the rationale behind regulation? Does such a change hold any significance for economic theories?

The prudential approach that characterised pre-crisis financial regulation rests on a set of intellectual assumptions about the nature of financial markets. At the core of these assumptions is the efficient market hypothesis (EMH), according to which the market is efficient and rational, meaning that



Image Credit: Melanie Friedrichs

It's a ba-aa-aaad world

market prices are good indicators of true economic value.

Since its participants are rational, we can consider the market as self-correcting. As a consequence, financial innovation can be assumed to be beneficial, thus justifying deregulation. Moreover, if markets are self-correcting, then market discipline is a more effective tool than regulation or supervisory oversight.

The only scope for regulation then becomes that of removing the impediments – information asymmetries, monopolies, excessive regulation – which might interfere with the market's efficient operation.

At this point care should be taken. An extremely relevant consequence of the belief in the EMH is how risk is perceived. If we accept that market participants' choices are rational, then price movements – and thus the risk inherent to financial markets – can correctly be inferred from mathematical quantitative analysis. The idea is that the analysis of past price movement patterns can deliver statistically robust inferences relating to the probability of price movements in future.

All these intellectual assumptions found practical translation in the pre-crisis regulatory agenda and, as we have seen, determined a failure in identifying the growth of systemic global risk.

Paradoxically, because of all recent financial developments and reliance on scientific-proof risk analysis, the financial system was believed to have become more stable and the amplitude of economic cycles less pronounced. In fact, just in the wake of the crisis, no less authority than the IMF observed that “there is growing recognition that the dispersion of credit risk [...] has helped make the banking and overall financial system more resilient”.

The perception of risk deserves particular attention for three main reasons. Firstly, because perceived risk is derived directly from the EMH. Secondly, because it represents the application of theories in our practical world – through regulation. And lastly, because financial activities and regulation are precisely about the management of risk.

Financial behaviour, risk management and regulation all depend on the

beliefs of the aforementioned assumptions.

Now, we should note that the measures adopted by the post-crisis regulatory agenda – with a change of rationale – represent precisely a challenge to the assumptions on which the prudential approach rested; namely, the EMH and the nature of risk.

In fact, the significant shift in the emphasis of regulation – with a strong focus on the overall system and on the management of systemic risk across the economic cycle – calls into question and explicitly contrasts the belief in an efficient and self-correcting financial market, the rationality of its participants' behaviour and, as a consequence, the nature of risk and the mathematical forecast of price movements.

Legitimation Crisis

Up to this point we have seen that the post-crisis regulatory agenda differs from the pre-crisis one in that it entails a change in the rationale behind regulation. But the new rationale, the systemic approach to regulation, also puts into question the very intellectual assumptions of traditional financial

economics.

This discourse is captured well by the philosopher Habermas's notion of a legitimation crisis. In line with the argument, Habermas claims that some real crises (for instance, economic ones) determine – and require – a fracture between past and future modes of action. They have the power of bringing into evidence a whole set of assumptions that characterize the traditional paradigm of a discipline, or the usual course of events, and that renders our understanding of reality and our action

inconsistent with a mutated condition.

A legitimation crisis, therefore, questions the legitimacy of a whole theoretical paradigm, its consistency with reality, and implies a fracture with the old way of thinking.

Contemporary analyses often compare the recent financial crisis with the 1930s and the subsequent period of economic depression. In the end, that crisis resulted in the 1944 Bretton Woods regime, which set the new regulatory framework.

Bretton Woods meetings were guided

by an innovative, shared economic theory: Keynesianism. Conversely, the contemporary post-crisis regulation can coherently be understood as manifesting a legitimation crisis of traditional financial economics. It puts into question mainstream financial economics, but it is not yet the expression of a new economic theory.

Perhaps, to say it with Gramsci, we might be living in a period of catastrophic equilibrium: a situation in which the old paradigm is dying, and yet the new cannot be born. ■

PRODUCTIVITY IN THE UK: STABBING IN THE DARK

By Stephen Chandler

Imagine trying to solve a puzzle. You have assembled all of the pieces and they fit together perfectly. Nevertheless, the image looks nothing like what it should. To make matters worse, you have lost the box to help guide you. In essence, this describes the crux of the economic quandary the UK finds itself in – one of a “productivity puzzle”. Since the onset of the 2007-08 financial crisis, labour productivity has been remarkably weak, while unemployment has fallen. “Aha!” you say, “this is clearly a case of underinvestment”. That would seem to be the logical response. However, data from the UK in 2011 and 2012 suggest that net investment has remained positive. Unless there was some serious scrapping due to depreciation, it appears that the capital stock has been rising, albeit at a reduced rate. So therein lies the puzzle. Although labour productivity has recently started to improve, it is still some 16% behind the level implied by the pre-recession trend and 4% below its pre-crisis peak. So how did this



Please sir, may I have some more?

shortfall come about?

Some will inevitably turn to measurement issues. Trend rates have

recently shown a very modest increase despite output growth since 2013. The most promising outcome of measurement critique has been that of intangible assets, such as research and development (R&D). R&D is an input into the production process, but its output might not be immediately evident. For this reason, it is currently treated as intermediate consumption rather than investment. This understates GDP and therefore productivity. This inaccuracy in data is said to account for 4-5% of the shortfall in productivity, according

“ There may still be unexploited opportunities from capital reallocation, and an equivalent cost to economic potential ”

been criticised as being overly optimistic. Yet, the UK's labour productivity still lags behind our pre-recession level and has only

to the Bank of England. So what about the rest?

One argument that is widely popular but is looking less and less probable is that of labour hoarding. The thesis is that weak demand and uncertainty during the financial crisis caused firms to retain employment of excess workers, fearing that retraining and rehiring them once the economy recovered would prove too expensive. Labour market reforms have helped too. Declining union power and more flexible real wages allow firms to hold onto more workers. ONS firm-level data confirms this theory in the initial stages of the recession. From mid-2008 to 2010, the proportion of businesses experiencing declining output but flat employment increased from 11% to 20%. This suggests that companies did indeed react by holding workers and decreasing real wages. However, after 2010, the proportion of these firms barely changes. Martin Weale, external policy member

of the Monetary Policy Committee concludes that after 2012, this effect is non-existent: "If the crisis and recession had led to labour hoarding, then one might have expected a period of relatively rapid productivity growth later on". This might happen because as demand rises, hoarded labour becomes fully employed. Yet this is precisely the opposite of what we have seen. Even over the past years period of growth, productivity has not increased in such a rapid way at all. In fact, it has been stagnating.

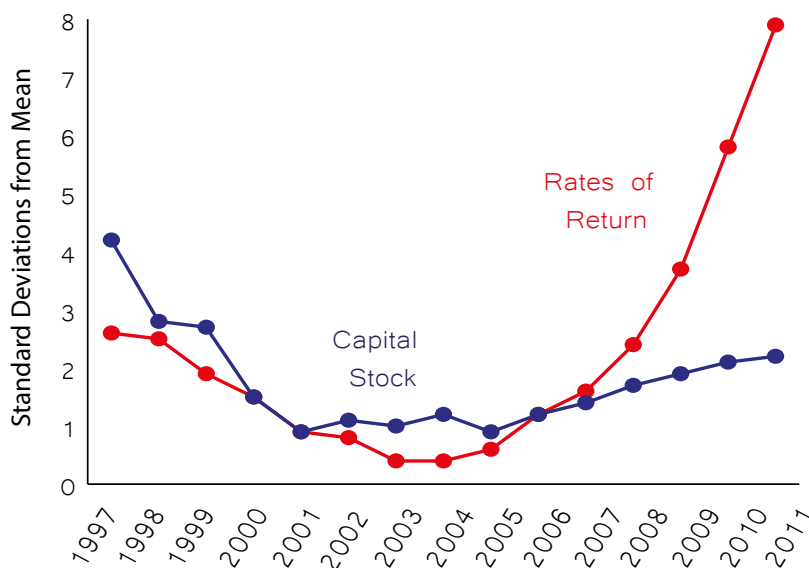
A more probable, yet more complex, explanation lies in capital allocation, or indeed misallocation. During the financial crisis, finance became more expensive, especially to small and medium-sized businesses. This encouraged firms to substitute towards labour (which became relatively cheaper), reducing capital and output per employee. Data has shown that the cost of capital had indeed risen by 10% from 2010. This goes some way to explain the shortfall. But in reality, it is hard to build such a strong case on the basis of only one model and there is data to counter argue this theory. For much of 2009 and early 2010 (after the aggressive easing in monetary policy but before the start of the Euro area crisis) the cost of capital was lower than before the crisis. Yet the productivity numbers looked odd even back then. What Ben Broadbent, external member of the MPC, suggests is that we should be looking at the allocation rather than the cost

of capital.

Think of the various sectors that make up our economy. Assume initially that resources used in production – capital and labour – can be easily moved from one sector to another. A relative increase in price in one sector would increase returns in that sector, drawing resources away from other sectors. Eventually, factor prices (wages and rate of return) become the same as before, but with a different mix of capital allocation between sectors. However, what UK data shows

is that there is a capital mismatch between different sectors, illustrating a dispersion of output across different sectors during the crisis. In any case, it becomes clear that output levels have varied hugely between sectors during the recession, since some sectors have been hit worse than others by effects of the recession. Whatever the underlying causes, the fact of this sectoral dispersion is undeniable. However, when we look at the

Cross-Sector Volatility in Capital Returns



movement of capital, we see a striking lack of movement.

This suggests that, according to Ben Broadbent, there may still be "unexploited opportunities from capital reallocation, and an equivalent cost to the productive economic potential". Companies with rising rates of return are in a position where they are capital constrained. This rings true: we regularly hear of medium-sized firms with profitable ideas that have been unable to finance them. On the flip side, there was an increase in bank "forbearance" (a form of repayment leniency) to more unproductive firms, propping them up. This was largely because of government pressure to curb the pernicious effects of unemployment. So this goes part of the way to explain our puzzle.

Returning to our initial puzzle, it seems that we now have a clearer picture as to the range of problems given to explain the UK's predicament. In short, we now have the picture on our box to help us solve the puzzle. However, we still have little evidence to shed light on which of our explanations is the most prominent and relevant. It is hard to think of a policy to tackle a problem when we still have little idea of which cause is most significant. We now need to arrange the pieces of our puzzle to fit the picture. Once we establish a correlation between policy and effect, we can pursue this course of action. But it is hard to do so without some blind stabbing in the dark. That is our next step. ■

FINANCIAL TECHNOLOGY AND THE GOOD SOCIETY? THE PROMISE OF FINTECH STARTUPS

By Honglin Jiang

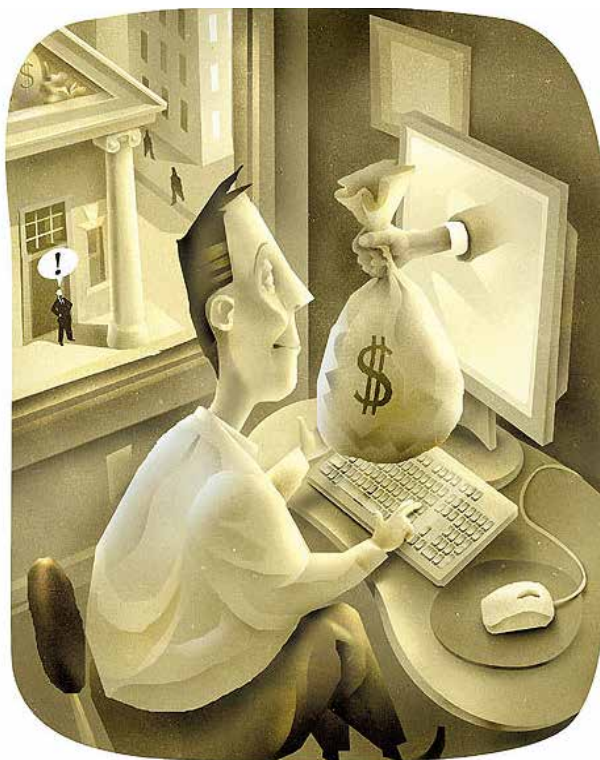
In his 2012 book “Finance and the Good Society”, Nobel prize winner Robert Shiller laid out a manifesto for finance to fulfil its social contract as an enabler of enterprise, innovation and production. With public approval and confidence in the industry at its lowest ebb in living memory, it was a brave affirmation of what financial capitalism could achieve for society. Now, a host of financial technology startups are realising his vision of increasing transparency, reducing frictions, and democratising finance. Former chairman of the Federal Reserve Paul Volcker famously remarked that the ATM was the only financial innovation that he could think of that had improved society. These young companies are out to prove him wrong by using the internet and peer-to-peer (P2P) matching algorithms to bypass the traditional banking system and thereby redefine the way households and companies save and raise capital.

For small and medium enterprises (SMEs), capital for expansion, everyday operations and trade financing is the lifeblood of the business. Given that SMEs account for roughly 60% of private sector jobs, a downturn in credit provision to SMEs has serious implications for the real economy. Companies such as Funding Circle and Assetz are helping SMEs reduce their reliance on high street banks by matching them with thousands of savers from the household and asset management sector. A business in need of medium term (1 to 5 year) credit can apply for a loan via P2P lenders platform and explain to investors the purpose In his 2012 book “Finance and the Good Society”, Nobel prize winner Robert Shiller laid out a manifesto for finance to fulfil its social contract as an enabler of enterprise, innovation and production. With public approval and confidence in the industry at its lowest ebb in living memory, it was a brave affirmation of what finan-

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prove him wrong by using the internet and peer-to-peer (P2P) matching algorithms to bypass the traditional banking system and thereby redefine the way households and companies save and raise capital.

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by matching them with thousands of savers from the household and asset management sector. A business in need of medium term (1 to 5 year) credit can apply for a loan via P2P lenders platform and explain to investors the purpose for the loan and why they are creditworthy. The investors can then bid for incremental “loan parts” via a timed auction process. Businesses seen as particularly attractive will then also attract the lowest interest rates via this market-price setting auction system. Funding Circle charges the business a fee for arranging the loan and takes a cut of the interest payments, but at a spread far lower than traditional banks. By cutting the amount of economic rent extracted by the banking sector, P2P lending reduces frictions between borrowers and lenders

and ensures both parties can be better off.

This process works well for established businesses with some record of profits and cash flows, but new businesses and startups would likely find credit prohibitively expensive or unavailable. Traditionally, they raised initial capital from friends and family or angel/venture capital funds, but equity crowdfunding is shaking up these kinds of arrangements. Platforms such as Seedr and CrowdCube are in their early stages, but seeing rapid growth as entrepreneurs and investors realise P2P's potential. Budding entrepreneurs can raise capital on their own terms and market their company directly to small investors, who are also likely to be customers who have tried and believe in the product. Conceptually, this approach is not unlike that of Kickstarter, which gives early stage backers privileged or exclusive access to a promised final product. Either way, such an approach encourages entrepreneurs to pursue their ideas by spreading more of their risk among those investors who can bear it. The net benefit to society accrues through the dynamism of startups who get the opportunity to develop and refine new products, and through small investors who gain access to previously unavailable investment opportunities.

In consumer credit, existing incumbents are also facing competition from a new breed of P2P lenders. Led by Zopa in the UK and Lending Club and Prosper in the US, these companies

arrange financing and consolidation of consumer debt at interest rates lower than those of banks and consumer finance providers. These types of loans are particularly useful for consolidating credit card debt which is one of the most expensive types of credit available, short of payday lenders and loan sharks. Indeed, by repaying more expensive credit with cheaper credit from P2P loans, the indebted consumer immediately boosts his solvency. Lenders, on the other hand, can earn far more attractive yields than those on offer from bank deposits by diversifying across many different loans.

Some P2P lenders even set aside provisions for bad debt to help cover losses in the event of default.

In each of the markets considered, there are clear benefits to encouraging P2P finance. Firstly, economic frictions represented by the spread between borrowing and lending interest rates can be substantially reduced. This improves the allocative efficiency of the economy

by encouraging credit to flow to where it can be most productively used. Secondly, there is a direct match between a dollar invested with a dollar borrowed, thus improving financial stability. By cutting banks out of the credit allocation process, the economy would be less prone to credit fuelled booms and busts. Risks are dispersed and disaggregated among many agents, rather than being concentrated in a handful of too-big-to-fail banks. Thirdly, lenders and platforms have access to increasing amounts of data regarding the specific assets being financed. Whether the underlying claim of a loan or share is a household, business or property, investors have more information than ever with which to evaluate risks. With the advent of big data and sophisticated credit scoring algorithms, P2P lenders may be able compete directly with the banks in evaluating credit risk.

Nonetheless, the sector is not without risks of its own. The recession of 2008-2009 occurred when the industry was still in its infancy - lenders in the current zero interest rate environment have yet to endure a turning of the credit cycle and the inevitable busts it will bring. However, the industry's development stands to bring a substantial welfare benefit to society by reducing financial frictions and matching borrowers and lenders more efficiently. Therefore, government incentives such as a planned extension of tax-friendly ISA schemes in the UK to the sector should be lauded. By giving small investors a way to support and participate in the growth of the economy, P2P firms are contributing to Shiller's vision of a democratisation of finance. ■

“ P2P lending improves the allocative efficiency of the economy by encouraging credit to flow to where it can be most productive ”



