

EcoNZ@Otago

A MAGAZINE ABOUT CONTEMPORARY ECONOMIC ISSUES FOR EVERYONE

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email: econz@otago.ac.nz



FROM THE EDITORS

Welcome to the 40th issue of *EcoNZ@Otago*! Yes, 20 years have passed since our first issue in 1998, edited by Stephen Knowles. As well as four articles each issue (for 40 issues), *EcoNZ@Otago* is very proud to have featured Alan King's insightful commentaries on the New Zealand economy in every issue since 2000. A lot has changed in the world since then, for the better and also perhaps for the worse! In that spirit of a changing and diverse world, as you can see below, this issue has its usual range of eclectic articles (as well as Alan's commentary on the NZ economy, of course!). Thank you for reading *EcoNZ@Otago*. All of us in Otago's Department of Economics appreciate your interest.

PAUL HANSEN, MURAT ÜNGÖR
Department of Economics
University of Otago
Dunedin 9054

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Taking ownership of ecosystem services

Viktoria Kahui
viktoria.kahui@otago.ac.nz

Hildegard von Bingen, a medieval saint, is known for her writings on theology, music, medicine, philosophy, Christian mysticism and natural history. In contrast, it's very rare for modern researchers to be able to claim expertise across such an impressive breadth of topics. Nowadays academic and scientific disciplines are neatly segmented, but the segregation of economics from ecology has had far-reaching implications. The pollution of Lake Waiholo in Otago by dairy farm run-off is a local/national example. How did this pollution come about? In short, because no one 'owns' the lake's capacity to assimilate pollutants, which is an ecosystem service. Ownership has played an important part in humanity's history.

ONCE UPON A TIME...

Once upon a time, we were foragers rather than settlers, constantly battling with what economists call 'diminishing marginal returns'. Foraging for resources in a small neighbourhood leads, sooner or later, to a decrease in the rate of foraging success due to depletion, which forced early humans to expand their diet and foraging range.

Hazda men return from a hunt



Source: sci-news.com/othersciences/anthropology/science-social-structure-modern-hunter-gatherer-tribes-02809.html

Evolutionary ecologists, such as Eric L. Charnov, have studied the foraging behaviours of animals and early humans (Charnov 1976). It is really quite simple: forage in such a way that minimises your energy costs (which is the same as maximising your rate of net energy intake) and you will prosper.

Once a upon a time sometime later, humans mastered the art of animal husbandry and agriculture as an answer to the uncertainties of foraging life. But with this ingenious solution arose the very problem that makes the divorce of economics from ecology so difficult: who owns the land, the waters and all the 'ecosystem services' associated with them? Ecosystem services include all the benefits people receive from healthy ecosystems, such as food, clean water, timber, decomposition of waste, flood protection and aesthetic beauty.

Early foragers were free to take as they pleased; no one owned the forests and waters. All resources were open access. It is no different to a wolf pack entering uncharted forests and making a kill as they see fit (in an energy cost-minimising sort of way). But somewhere between foraging in the wild expanse of nature and the decision to hang around and establish a territory and take charge of nature's bounty, the need arose to define ownership.

Fisheries economist Gordon tells us why: *"The fish in the sea are valueless to the fisherman, because there is no assurance that they will be there for him tomorrow if they are left behind today"* (Gordon, 1954, p. 135). Hardin's famous 'tragedy of the commons' metaphor describes the same problem of unrestricted access to resources, in which the tragedy lies in the remorseless incentive for depletion, rather than unhappiness (Hardin 1968).

GOVERNING THE COMMONS

Nobel Prize-winning political economist Elinor Ostrom showed us that some communities, such as Alpine herdsman and Spanish huerta farmers, had figured out how to overcome the tragedy of the commons (Ostrom 1990). These communities share and regulate resources among their members, making them successful 'common-pool' resource owners. Arguably, many of the indigenous tribes of the world follow a similar common property model, but with a different world-view. No one truly owns mother earth.

The neat thing about common-pool ownership is that people become active participants in the decision-making process. Every intended and unintended effect of resource use is aired and negotiated among users and community members. For example, a farmer in Ostrom's common-pool model would not get away with draining a wetland (like at Lake Waiholo) that provides amenity services to the community such as clean water and birdwatching.

However, private ownership has largely come to replace common-pool ownership. Adam Smith, in his famous book *An Inquiry into the Nature and Causes of the Wealth of Nations* (first published in 1776), explained how specialisation and the accumulation of capital underpin economic efficiency and growth. Private property rights are required, otherwise there is no point in accumulating wealth; someone else could seize your investments – no different to Gordon's fish left behind in the water.

Toxic algae at Lake Waiholo



Source: odt.co.nz/regions/south-otago/toxic-algae-found-lake-waiholo

PRIVATE PROPERTY RIGHTS AND SUSTAINABILITY

So though private property rights have brought us the many good things that come with economic development such as low infant mortality, iPads and washing machines, they have come at an environmental cost that we as a society have to bear. There are many examples of such environmental costs.

The farmer whose dairy herd urinates into adjacent waterways is not accountable for the deterioration of water quality at Lake Waiholo; the landowner who drains her wetland for development is not accountable for the loss of birdwatching; the commercial fisher who dredges across the seabed to catch fish in the most efficient way is not accountable for the loss of sponge habitats; and the council that keeps subdividing land for residential and commercial development is not accountable for other people's loss of scenery and solitude.

Private property rights solve the tragedy of the commons for land use, fisheries and forests, and bring us economic wealth. Nevertheless, the tragedy continues remorselessly for the ecosystem services attached to them because no one owns them. Local and national governments apply regulations, but a fundamental, proactive change of property rights is needed. The dividends of a functioning ecosystem include everything from the air we breathe to the spiritual experience of meeting a fantail bird on your daily walk, and we, as a society, own those dividends.

Land ownership is a private property right that provides permanent access to the land, but it does not provide unlimited access to the land's ability to sequester carbon or provide native bird habitat. Ecosystem services should be managed as common property, locally, nationally and globally, as we see fit.

TIME TO COME TOGETHER

Ecologists know about ecosystems, and economists know about property rights. The two disciplines need to at least start talking to each other, to work on solutions to the problems that arise from undefined ownership of common-pool resources.

Governments need to take ownership of ecosystem services. Maybe polluters and land developers should pay for their detrimental impacts? Or maybe landowners should be compensated for maintaining healthy waterway environments? These are the sort of issues we need to start thinking about.

QUESTIONS TO THINK ABOUT

1. What are common-pool resources and why are property rights so important?
2. How do governments cope with pollution or over-fishing?
3. What kinds of institutions are successful in governing common-pool resources?
4. Does economic development promote the creation of institutions to govern common-pool resources?

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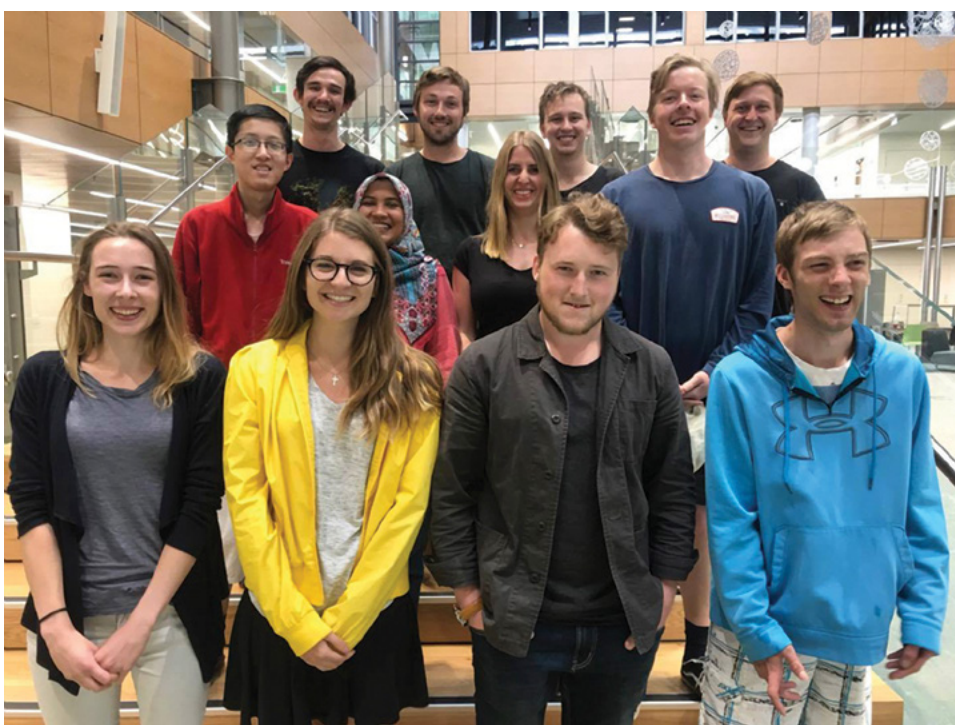
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Economics Masters (MEcon and MSc) Rogues' Gallery 2018



Back row: Andrew, Samuel, Zachary, Charlie. Middle row: Benjamin, Achsanah, Jamie, Thomas. Front row: Vivienne, Susanna, Finn, Shaun

The world's deadliest diseases: The WHO priority list of antibiotic-resistant bacteria

Paul Hansen

paul.hansen@otago.ac.nz



Penicillium chrysogenum

Source: en.wikipedia.org/wiki/Penicillium_chrysogenum.

We all take it for granted that if we get a cut or scratch or go into hospital for an operation, we won't die from an infection. But that's literally what often used to happen less than a century ago – a toothache could kill you! Antibiotics are the main weapon against bacterial infections. And yet antibiotics are losing their power to kill bacteria – and save our lives! – because bacteria are becoming increasingly antibiotic resistant. This article reports on a project by the World Health Organization (WHO) and experts around the world to create a priority list of antibiotic-resistant bacteria to guide research and development (R&D) into new antibiotics.¹

A VERY HAPPY ACCIDENT!

One of the world's greatest discoveries occurred by accident in 1928 when Scottish scientist Alexander Fleming noticed something weird in his untidy laboratory: the bacteria in a petri dish that had become contaminated with a mould were dead! Here's how Fleming modestly described his discovery of what he originally called "mould juice" and that became known as *Penicillium chrysogenum* (Brown 2005):

.....
One sometimes finds what one is not looking for. When I woke up just after dawn on September 28, 1928, I certainly didn't plan to revolutionise all medicine by discovering the world's first antibiotic, or bacteria killer. But I guess that was exactly what I did.
.....

Over the next two decades, chemists purified the mould and developed the drug Penicillin as an antibiotic or bacteria killer. Penicillin kills a large number of bacterial infections in humans – e.g. pneumonia, anthrax, sexually-transmitted diseases, mouth infections, diphtheria and cellulitis – without harming humans themselves.

Fleming shared the 1945 Nobel Prize in Physiology or Medicine with Howard Florey and Ernst Chain – "for the discovery of penicillin and its curative effect in various infectious diseases." (Nobelprize.org 2018). Since then, many kinds of Penicillin's have been developed, and also many other kinds of antibiotics too. Hundreds of millions of lives have been saved around the world as a result.

NOW FOR THE BAD NEWS ...

Because bacteria are continually evolving they are becoming increasingly resistant to antibiotics. This evolutionary process has been exacerbated by decades of overuse and misuse of antibiotics on human, animals and plants. As a result, antibiotics are not as effective at killing bacteria as they used to be; bacteria are regaining their power to kill humans.

According to Ed Whiting, director of policy at the Wellcome Trust, "drug-resistant infections already kill 700,000 people a year globally" (quoted in Boseley 2017). This number could increase to 10 million people a year by 2050 (The Guardian 2017).

¹ This article is based on recent research involving the author that is fully reported in Tacconelli et al (2017) and Weyer et al (2017).

Here is the how the WHO (Weyer et al 2017) summarises the menace posed by “antimicrobial” – including antibiotic² – resistance:

Worsening antimicrobial resistance could have serious public health, economic and social implications. The threat of antimicrobial resistance is also becoming a key consideration for programmes addressing maternal and child health, sexual and reproductive health, foodborne diseases, water and sanitation, and infection prevention and control. The World Bank has warned that antimicrobial resistance could cause more economic damage than the 2008 financial crisis. And although the 21st century is being shaped by technology and innovation, humans could soon find themselves in an era where simple infections once again kill millions every year.

THE CUPBOARD IS BARE

Notwithstanding the massive threat posed by antibiotic resistance, R&D into new antibiotics has lagged behind. Too few new antibiotics are in the pipeline because of the expense and complexity involved in developing them.

Hence, in 2016 the WHO was asked by its member states to create a priority list of antibiotic-resistant bacteria to guide R&D into new antibiotics by pharmaceutical companies, research institutions and universities.

A LOT TO CONSIDER

Ranking diseases according to their priority for R&D involves considering multiple considerations or criteria simultaneously – e.g. to mention but three such criteria here: the number of people killed by each disease, the extent of its antibiotic resistance and the number of new antibiotics in the ‘pipeline’. The WHO chose to use Multiple Criteria Decision Analysis (MCDA) to handle the inevitable trade-offs between the criteria involved.

MCDA is a systematic approach to prioritisation usually supported by specialised decision-making software³ that is increasingly used in the health sector. In the present context, MCDA involves evaluating diseases’ priority for R&D according to multiple criteria, based on the judgments of experts in infectious diseases, clinical microbiology, public health and pharmaceutical R&D.

The WHO project, led by Professor Evelina Tacconelli of Tübingen University and supported by 1000minds software (1000minds.com), involved these four steps:

1. Selection of the antibiotic-resistant bacteria to be prioritised, and identification of relevant criteria for prioritising them.
2. Collection and synthesis of evidence to assess the bacteria and rate them on the criteria.
3. Determination of weights on the criteria, representing their relative importance, based on surveying 70 experts from around the world.
4. Priority ranking the bacteria based on the criteria and weights, and checking the ranking’s robustness.

These 10 criteria, in decreasing order of importance,⁴ were used to prioritise the bacteria: (1) treatability, (2) mortality, (3) health-care burden, (4) 10-year trend of resistance, (5) prevalence of resistance, (6) transmissibility, (7) community burden, (8) preventability in the health-care setting, (9) pipeline, (10) preventability in the community setting.

DRUM ROLL PLEASE!

The WHO published its priority list of 12 antibiotic-resistant bacteria to guide R&D – stratified into three tiers: critical, high, and medium priority – as presented in Table 1 (reproduced from Willyard 2017). In addition, multidrug-resistant tuberculosis was classified as a global priority for R&D too.

Table 1: WHO priority list of antibiotic-resistant bacteria for R&D into new antibiotics

Threat list

Bacterium or bacterial family (and antibiotics it resists)	Typical effects
Priority: critical	
1. <i>Acinetobacter baumannii</i> (carbapenem)	Hospital infections
2. <i>Pseudomonas aeruginosa</i> (carbapenem)	Hospital infections
3. Enterobacteriaceae (carbapenem) ESBL-producing	Hospital infections
Priority: high	
4. <i>Enterococcus faecium</i> (vancomycin)	Hospital infections
5. <i>Staphylococcus aureus</i>	Skin infections (methicillin, vancomycin), pneumonia, bloodstream infections
6. <i>Helicobacter pylori</i> (clarithromycin)	Infection can lead to stomach ulcers and cancer
7. <i>Campylobacter spp.</i> (fluoroquinolone)	Diarrhoea
8. Salmonellae (fluoroquinolone)	Diarrhoea
9. <i>Neisseria gonorrhoeae</i> (cephalosporin, fluoroquinolone)	Gonorrhea
Priority: medium	
10. <i>Streptococcus pneumoniae</i> (penicillin-non-susceptible)	Pneumonia
11. <i>Haemophilus influenzae</i> (ampicillin)	Childhood pneumonia, meningitis, bloodstream infections
12. <i>Shigella spp.</i> (fluoroquinolone)	Diarrhoea

ESBL, extended-spectrum β -lactamase. Bacteria that produce this enzyme are resistant to certain classes of antibiotics.

Source: Willyard (2017).

2 Antimicrobials are chemicals that kill or inhibit the growth of microscopic organisms such as fungi, alchaea, algae, bacteria, etc. Antibiotics kill or inhibit the growth of bacteria.

3 For recent MCDA software surveys, see Weistroffer and Li (2016) and Oleson (2016).

4 Weights are available from Tacconelli et al (2017).

Colonies of *Pseudomonas aeruginosa* and *Staphylococcus aureus* (yellow pigment) on tryptic soy agar



Source: en.wikipedia.org/wiki/Pseudomonas_aeruginosa.

CONCLUSION

Antibiotics have protected humans (and other animals and plants too) for the last 70 years, but their potency is waning due to antibiotic resistance. The priority list created by the WHO is intended to help prioritise R&D into new antibiotics by pharmaceutical companies, research institutions and universities. Let's hope such R&D is successful!

FURTHER READING

The research this article is based on is fully reported in Tacconelli et al (2017b) and Weyer et al (2017).

QUESTIONS TO THINK ABOUT

1. Why have many diseases become resistant to antibiotics?
2. Some people consider that if effective antibiotics were no longer available to fight infections, it would be like returning to the Dark Ages. Do you agree? How would your life change, do you think?

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Who cares? Some insights into the Japanese and New Zealand elderly care sectors

Arlene Garces-Ozanne¹

arlene.ozanne@otago.ac.nz



Elderly people eat lunch at an elderly nursing home in the city of Toyoma

Source: japantimes.co.jp

One of the most noteworthy developments in the last century has been the significant increase in global average life expectancy. Although there are variations across nations, the fact remains that since the 1900s global life expectancy has more than doubled and now sits at roughly 70 years. Many factors have been put forward to explain why life expectancy is increasing, including income, education, urbanisation, health care spending, access to safe drinking water and proper nutrition, empowerment ... This list could go on and on.

On the flip-side, many of the nations experiencing high life expectancy also have low birth rates, contributing to an ageing population and higher dependency ratios,² and this is a concern. On the other hand, some people probably think there is really nothing to worry about: The objective of many medical and technological advances is to promote longer lives, right?

So why should we care? We care because we don't just care about the length of life; we want quality of life as well. And the challenges of caring for this ageing population and ensuring *quality* of life, not only for the elderly but for the rest of the population as well, need to be addressed.

A STORY OF TWO PACIFIC ISLAND NATIONS!

Japan is the world's fastest ageing nation. As of 2014, one out of eight people in Japan is at least 75 years old and there are twice as many people aged 65 or older than children under the age of 15 (Hongo 2015).

The Japanese have traditionally believed that family should look after family; and they have, but this is changing for several reasons. First, perhaps because of the reduced individual sense of duty and responsibility for older members of society; second, because women, the traditional caregivers in family units, now participate more fully in the formal labour market; and third, caring for the elderly is difficult.

"Several times a night, Midori Ide (29) wakes up to help her 96-year-old grandmother use the toilet. To make sure she can assist immediately, Midori sleeps right next to her grandmother."

"Just last month (February 2015), a 71-year-old husband was arrested for killing his wife who had dementia. "I got too tired from looking after her," he confessed, according to local media. "I wanted to take my own life, too."

(Quoted from Oi, 2015)

¹ Arlene is currently working on a research project exploring the pathways, employment and retention mechanisms of native- and overseas-born workers in the institutional elderly care sector in New Zealand and Japan.

² The dependency ratio is the number of people under the age of 14 and over the age of 65 as a proportion of the total population aged 15-64.

Son helps his 93-year old mother



Source: stuff.co.nz

In New Zealand, the population over the age of 65 makes up 14.3% of the population (Statistics NZ 2013), and by 2036, it's estimated that 21-24% of people will be over 65. This projected demographic transition does not come as a surprise. Since the 1990s the implications of the ageing population for social and economic planning has been debated by government, welfare groups, health care providers and others.

HOW TO PROVIDE QUALITY HEALTH CARE, AND AT WHAT COST?

An ageing population puts stress on a country's financial and workforce resources. Prime working-age adults (25-59 years) earn more than they consume, whereas the young and the elderly do the opposite (Lee and Mason, 2017). Increased consumption by the elderly may be offset in part by a smaller proportion of children in the population. However, as a long-term solution, the problem with this is that there will then be even fewer workers in the future to finance consumption.

Japan's and NZ's fertility rates have been declining since the 1960s: 1.41 and 2.02 births per woman for Japan and NZ respectively (2017 estimates; World Fact Book, 2017) – well below the global replacement fertility rate of 2.1 identified by the United Nations Population Division.

In 2000, in part to help alleviate the burden of caring for elderly family members, the Japanese government implemented the Long Term Care Insurance (LTCI), where all Japanese residents over 40 are required to pay into this insurance scheme which is used to pay for about half of long-term care services. Since then, the number of elderly accessing long-term care has more than doubled, indicating that this kind of insurance scheme is sustainable, and it may be implemented in other countries too. In NZ, the government provides a universal pension to New Zealanders from the age of 65, from a state-owned investment fund.

Another option is to promote an increase in the support ratio (total number of workers divided by all consumers: young, prime age and elderly) through worker migration. However, this option currently has some drawbacks in particular for the two countries we are considering, which are discussed below.

WHO CARES?

Apart from the financial costs associated with increased nursing and social care for an ageing population, there is also an increasing demand for workers in the elderly care sector. But where will these care workers come from? Care work, after all, is usually a low-paying (minimum-wage) job which is also physically demanding and with high risks of work injuries.

In recent years, the role that migrant (or overseas-born) care workers play in helping relieve the shortage of care workers has been growing for both Japan and NZ. In 2008, the Japanese government started accepting a limited number of nurse and care work trainees from Indonesia, the Philippines and Vietnam under economic partnership agreements (EPAs) with these countries.

Under the EPA programme, trainees are required to undergo a three-year certified caregiving course at a government-approved training facility, after which they are required to pass a national licensure examination for certified caregivers so they can work in Japan indefinitely. A trainee can take this exam a maximum of three times (in case they fail the first time); if they fail on the third attempt, they must return to their home country. Course work includes the study of general care work, dementia care and the Japanese language.

Trainees from Indonesia study Japanese to prepare for on-the-job training



Source: english.ryukyushimpo.jp/2014/02/22/13215/

Though the Japanese government, the training and nursing facilities invest a huge amount of time, money and effort to ensure that trainees pass the national examinations, less than 50% of trainees actually pass (based on conversations with care training facilitators and overseas-born caregivers in Japan). And for people who pass, up to 38% choose to return to their home countries (Yūko 2017).

A primary reason for failing the examination is the lack of proficiency in the Japanese language even after three years of language courses. For those who returned to their home countries in spite of passing, the main reasons cited were the difficult working conditions, in particular the long hours.

Beginning in November 2017, the Japanese Technical Intern Training Program will be expanded to include foreign workers for health care services. The Technical Intern Training Program is a system introduced in 1993 that has become an indispensable source of labour – mainly in the industrial, agricultural and fisheries sectors – from developing countries for Japan.

While many in Japan doubt the success of the EPA and the technical training program in recruiting and retaining overseas born care workers, it is worthwhile noting that in Japan care work is considered a professional and skilled job. Also, when overseas-born workers pass the national examinations they are allowed to work in Japan indefinitely (under the EPA program, but only up to five years under the technical training program).

WE DO THINGS DIFFERENTLY HERE

Things are very different in NZ, compared to Japan. Callister et al (2014) show that overseas-born caregivers make up over 30% of the entire elderly care worker force and this percentage has been increasing since 1991. Given the current and growing needs of our elderly population, the authors strongly recommend developing new migration streams for aged care workers that would create easier pathways to permanent residency and citizenship.

This call is reiterated in a recent study by the Salvation Army and St. Andrew's Village in Auckland (2017). However, care work is categorised as ANZSCO Level 4 in NZ, and is not on any of the shortage lists identified by Immigration New Zealand. Hence, overseas-born workers are unlikely to be able to obtain a work permit or visa as a care worker, unless they are paid at or above \$35.24 per hour (Immigration.govt.nz).

In July 2017, the NZ government implemented a pay increase for care workers to a minimum of \$19 per hour. This pay increase (21%) still falls short of what is required under current immigration rules. Also, another recent immigration policy announcement on 19 April 2017 aimed at improving the long-term labour market contribution of temporary and permanent migration (Woodhouse, 2017) will make it even harder for overseas-born care workers to apply for work and residency.

When the new salary thresholds for the Skilled Migrant Category (SMC) and Essential Skills visa categories come into effect, the low wage offered in the caregiving sector (even after the July 2017 pay increase) will not qualify overseas-born care workers to apply under the SMC category. At the same time, changes in the Essential Skills category also involve the introduction of remuneration bands aligned with the new thresholds under the SMC. The duration of the lower-skilled Essential Skills visa will also be limited to a maximum of three years, with a stand-down period before an applicant may re-apply.

WHO CARES FOR OUR CARERS?

In order to ensure that we are ready to meet the demands of our ageing population, we need to know how we will meet these needs and what steps we can take to ensure that the elderly are cared for, but also that needs of care-workers are met both financially and in terms of institutional support.

Happy elderly people at Shinko Fukushimai, Kawasaki City



QUESTIONS TO THINK ABOUT

1. How can we encourage employment in the elderly-care sector in NZ?
2. What are the implications of recent legislation changes in this sector?
3. What lessons can we learn from the Japanese experience?

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Structural transformation in CHINDIA: A comparison of the emerging giants

Murat Üngör

murat.ungor@otago.ac.nz



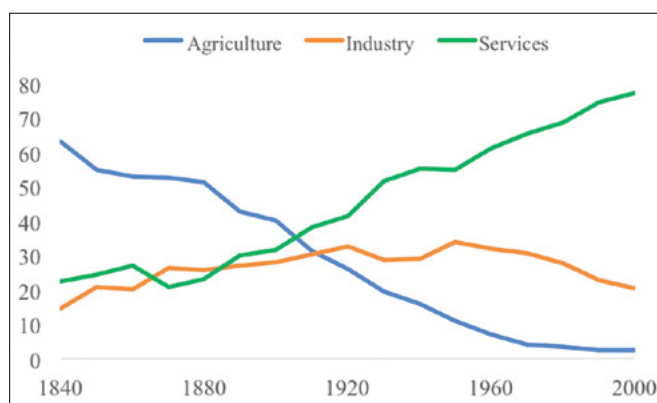
Source: iforexblog.com/news-item/future-global-economy-china-vs-india

Since the pioneering early contributions of Fisher (1935)¹, Clark (1940), Chenery (1960) and Kuznets (1966), economists have agreed that sustained economic growth and a permanently higher level of income per capita is strongly associated in the data with a structural transformation.

In this transformation, changes in the sectoral composition of production are observed. For example, the share of agriculture in a country's labour force and total output declines as income per capita increases. In other words, a substantial shift occurs in the composition of output and employment away from agriculture towards non-agricultural activities (e.g. manufacturing). This is one of the well-known stylised facts of economic development and can be visualised using the historical data from the United States (US).

Figure 1 displays the employment share of agriculture, industry (manufacturing, construction, and mining) and services for the US during 1840-2000.² This figure documents a long-run decline in the employment share of agriculture, increase in the employment share of services, and the inverted U-shaped pattern in the employment share of industry during the last two centuries.

Figure 1: Sectoral employment shares in the US (%), 1840-2000



Source: Herrendorf et al (2014).

Though there is a lot of data and many quantitative studies into the process of structural transformation in today's advanced economies, it's also important to know more about structural transformation in today's less developed (or developing) economies. To what extent are they following different paths from today's developed economies? And if so, what are the factors that give rise to these differences? China and India constitute perfect cases to study such questions, as they jointly account for more than one-third of the global population.

1. Allan George Barnard Fisher (1895-1976) was born in New Zealand. He completed a doctorate at the London School of Economics in 1924 and held a professorial post at the University of Otago from 1925 to 1935. Endres (1988) discusses Fisher's contribution to economic thought in New Zealand.
2. Data are available at: sites.google.com/site/valentinyiakos/Home/papers/handbook.

EMERGING GIANTS: A TOUR D'HORIZON

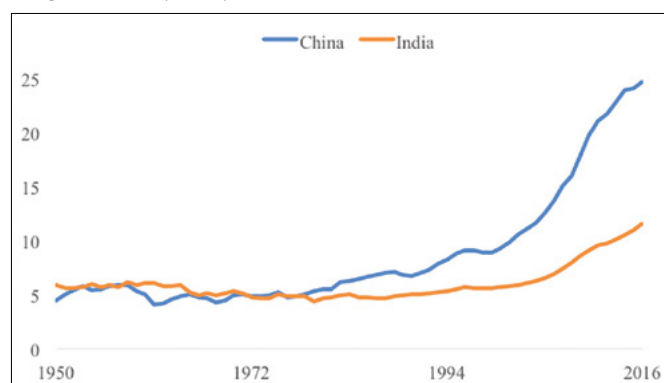
The US economy is the largest in the world. As of 2016, US gross domestic product (GDP) was \$18.6 trillion (measured in current US\$ prices), almost a quarter of the global economy. China, the world's most populous country, had a \$11.2 trillion GDP in 2016, making it the second largest economy in the world. India, the world's second most populous country, has a \$2.3 trillion economy in 2016, which makes India the world's seventh largest economy – behind the US, China, Japan, Germany, United Kingdom, and France.³

Figure 2, using PPP-adjusted⁴ per capita GDP as a proxy for economic development, illustrates the speed at which China and India are catching up with the US. China today refers to the People's Republic of China, the state that was established in 1949 after the victory of the Chinese Communist Party under the leadership of Chairman Mao Zedong.⁵ Beginning in the early 1950s, economic planning was introduced in China, which was modelled mimicking the system of the Soviet Union.

CHINA

In 1950, per capita GDP in China was less than 5% of the US level. This ratio stayed the same until 1978. China's economic reform towards a market-oriented economy began in 1978 and has been recognised as essentially successful.⁶ Per capita income in China grew at an annual average rate of 2.6% during 1950-1977, but then at 6.2% during 1978-2016, which is 4.3 percentage points higher than that of the US economy. In 2016, GDP per capita in China reached 25% of the US level.

Figure 2: GDP per capita in China and India, relative to the US (%)



Source: The Conference Board Total Economy Database, November 2017.

INDIA

On June 15, 1947, the British House of Commons passed the Indian Independence Act, which divided India into two dominions, India and Pakistan. On August 15, 1947, Jawaharlal Nehru addressed the nation with a new Declaration of Independence of India.⁷ In 1950, per capita GDP in India was around only 6% of the US level.

India embarked on an 'autarkic'⁸ path of development with import-substitution policies. Such policies did not bring prosperity to India and relative per capita income was only 5% in 1990. Even as late as 1990, India had one of the most closed economies in the world (Joshi, 2017, p. 247).

A programme of reform was launched in July 1991 to re-integrate India into the global economy and reap the economic benefits thereof. Per capita income in India grew at an annual average rate of 1.9% during 1950-1990, but then at a rate of 5.2% during 1991-2016, which is 3.4 percentage points higher than that of the US economy.⁹ In 2016, GDP per capita in India was 11.5% of the US level.

The World Bank presents a classification system where countries are annually ranked by their level of gross national income (GNI) per capita.¹⁰ According to this measure, China was classified as a low-income economy in 1990, a lower-middle income country in 2000 and became an upper-middle income country in 2010. India, on the other hand, was categorised as a low-income country until 2007. Starting in 2007, India has been considered a lower-middle income country.

STRUCTURAL TRANSFORMATION

Let's now turn to measuring structural transformation. The two most common measures of economic activity at the sector level are employment shares and value-added shares. Employment shares are calculated by using workers by sector, and value-added shares are typically expressed in current prices.

The Groningen Growth and Development Centre (GGDC) 10-Sector Database¹¹ provides long-run internationally comparable data on sectoral productivity performance in Africa, Asia and Latin America. The database includes annual time-series of value-added and persons employed for ten broad sectors of the economy (Timmer et al, 2015).¹² The research reported here is based on constructing separate accounts for these three major economic sectors: (i) agriculture, (ii) industry (mining, manufacturing, utilities, and construction), and (iii) services (wholesale, transport, finance, personal, and government services).

Figure 3 depicts the evolution of sectoral employment and value-added shares in China and India during 1980-2010. Panel (a) shows that from 1980 to 2010 the employment share in China's agriculture fell from about 69% to less than 37%, whereas the share of services increased from 13% to about 35%. Industrial employment share also increased from 18% to about 29%.¹³

Panel (b) plots the value-added shares of China between 1980 and 2010. In 1980, agriculture captured 31% of the Chinese value-added, whereas in 2010 it had the lowest contribution to Chinese total value-added, with 10.7%. The value-added share of the service sector increased from about 20% in 1980 to about 40% in 2010. Industry has been accounting for roughly half of the total value-added of China during the sample period.

3. Data are from the World Development Indicators (World Bank, 2017).

4. PPP (purchasing power parity) is the most widely used adjustment in measuring living standards, because it takes into account the actual cost of living. I use the variable "GDP per capita in 2016 US\$ (converted to 2016 price level with updated 2011 PPPs)", which reflects the rapid declines in the prices of information and communication technology goods, from the November 2017 version of the Conference Board Total Economy Database.

5. Mitter (2008) provides a brief, yet comprehensive, introduction to modern China.

6. See Üngör (2016) for a brief review of China's economic development since 1978.

7. theguardian.com/theguardian/2007/may/01/greatspeeches

8. Autarky means to be self-sufficient.

9. From 2003 to 2011, the rate was nearly 7% a year.

10. siteresources.worldbank.org/DATASTATISTICS/Resources/OGHIST.xls

11. rug.nl/ggdc/productivity/10-sector

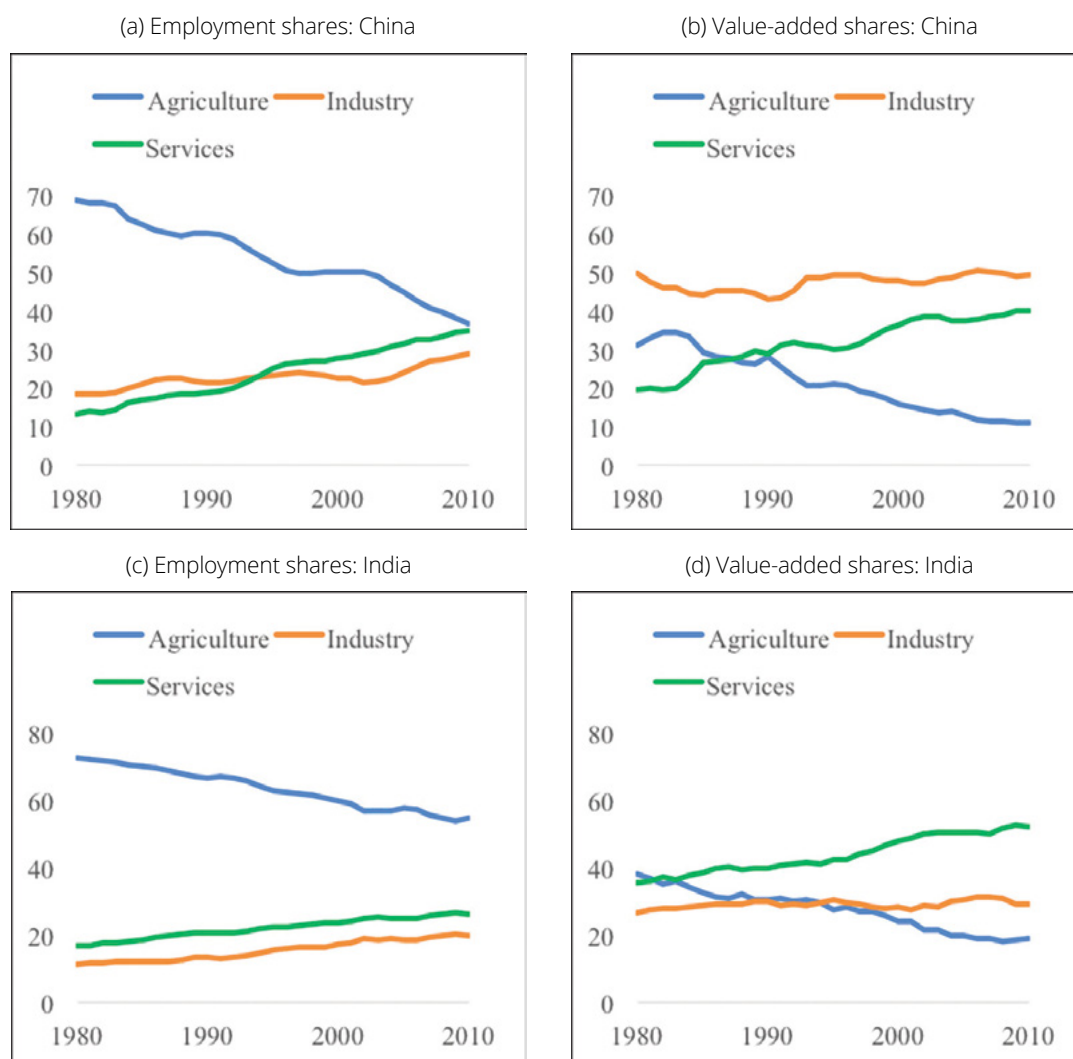
12. (1) agriculture, hunting, forestry and fishing, (2) mining and quarrying, (3) manufacturing, (4) utilities (electricity, gas and water supply), (5) construction, (6) wholesale and retail trade, hotels and restaurants, (7) transport, storage and communication, (8) finance, insurance, real estate and business services, (9) community, social and personal services, and (10) government services.

13. Dekle and Vandenbroucke (2012) develop a model to quantitatively assess the driving forces of China's structural transformation since 1978.

Panel (c) in Figure 3 shows that agriculture remains the dominant activity in terms of employment in India. In 2010, more than half of India's labour force was still in agriculture, though this proportion was down from 72% in 1980. From 1980 to 2010, the share of services increased from around 17% to almost 26%. Industrial employment share also increased from 11% to about 19.5%.

Panel (d) plots the value-added shares of India between 1980 and 2010. The value-added share of the service sector increased from about 36% in 1980 to 41% in 1991. Following the economic liberalisation in India, the service sector has gained prominence in the economy as it accounts for the largest share of value-added. The share of this sector in value-added has been growing very rapidly.¹⁴ The service sector has been accounting for more than half of the total value-added of Indian economy since 2002. In comparison, the industry share has remained stagnant, growing only from 26% in 1980 to 29% in 2010.

Figure 3: Sectoral composition of employment and value-added, 1980-2010 (%)



Source: The GGDC 10-Sector Database.

SECTORAL PRODUCTIVITY DIFFERENCES

Figure 4 presents the time paths of labour productivity (measured as value-added per worker) (1980=1) in China and India respectively during 1980-2010.¹⁵ Panel (a) shows that all three sectors experienced rapid labour productivity growth rates in China and the corresponding figures are 4.9%, 7.7% and 5.9% for agriculture, industry and services respectively. The relative performance of India has been weaker compared to that of China. The annualised growth rates in labour productivity between 1980 and 2010 are 2.1%, 2.6% and 4.0% for agriculture, industry and services respectively in India.

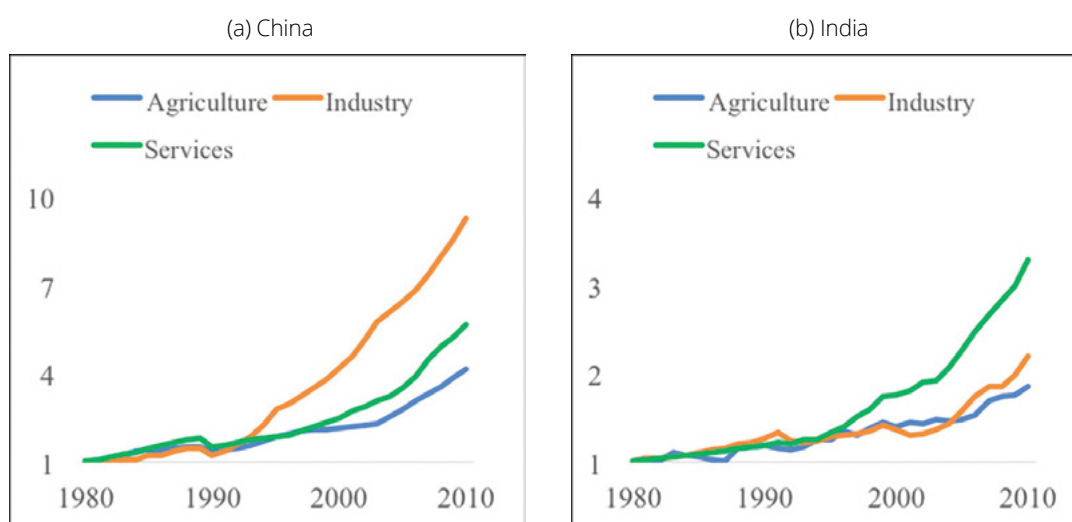
It is important to note there might be several reasons behind the differences in sectoral productivity growth rates within and across countries. Increases in labour productivity may arise from the application of changes in production technology, from higher levels of investment in the production process, changes in the organisation of production, or from higher levels of skill embodied in the labour force¹⁶, to name a few possibilities.

14. Verma (2012) provides a quantitative exploration of the factors responsible for generating the services-led growth witnessed in India during 1980-2005.

15. Constant prices in local currency were used when deriving the growth rates of labour productivity in each country. The levels are not directly comparable across countries because they do not reflect the PPP adjustments.

16. It is very important to note that that employment may not reflect changes in true labour input since there are systematic differences in hours worked or in human capital per worker across sectors (Herrendorf et al 2014). There is an active research agenda in these areas. For example, Herrendorf and Schoellman (forthcoming) document that agriculture has less educated workers for 13 countries ranging from relatively rich countries (such as Canada and the US) to relatively poor countries (such as India and Indonesia).

Figure 4: Labour productivity by sector, China vs. India (1980=1)



Source: The GGDC 10-Sector Database.

Agriculture in India had the lowest labour productivity growth rate during 1980-2010. This is important because agriculture dominates the structure of the Indian economy in terms of employment (see Panel (c) in Figure 3).

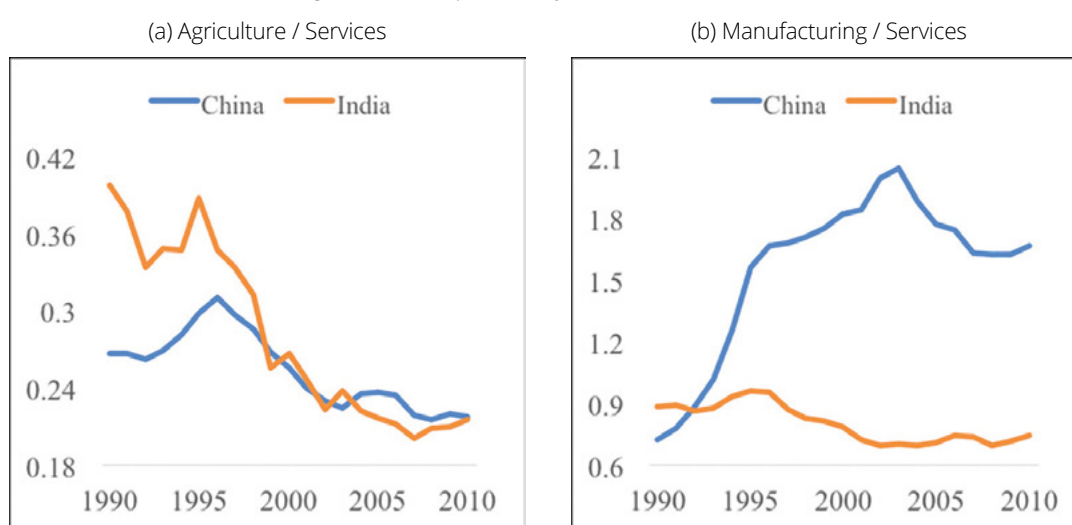
Another observation for India is that the service sector had the highest labour productivity growth rate during 1980-2010. This is in contrast to China, whose industrial sector has shown the highest growth rates. This requires an elaboration and Figure 5 provides a perspective for this observation, plotting the time paths of labour productivity levels in agriculture and in manufacturing relative to services in each country.

Panel (a) in Figure 5 reveals that both countries have shown similar patterns of levels of agricultural productivity relative to the levels of their labour productivity in services.

Panel (b), however, tells us a different story. In terms of levels, India's service sector has been more productive than its manufacturing sector. On the contrary, China's service sector has been less productive, in terms of levels, than its manufacturing sector since 1993. For example, China's manufacturing sector was two times more productive than its service sector in 2002.

This finding is in line with the fact that China has become a global manufacturing warehouse. China is the largest manufacturing economy in the world, with a 25.5% share of global manufacturing value-added in 2016. India is in sixth place with a 2.8% share – behind China, US, Japan, Germany, South Korea and France. Manufacturing value-added in China totalled \$3.08 trillion in 2016 compared with \$2.18 trillion for the US and \$0.34 trillion for India.¹⁷

Figure 5: Labour productivity levels, relative to services.



Source: The GGDC 10-Sector Database.

17. Data are from the United Nations' Main Aggregates Database. The variable "Value Added by Economic Activity, at current prices – US Dollars" was used (unstats.un.org/unsd/snaama/selbasicFast.asp).

WHAT DOES THE FUTURE HOLD FOR CHINDIA?

The rising importance of emerging market economies in global economic affairs has been one of the central topics of the research in international macroeconomics of the past three decades. This is mainly due to the emergence of China and India as major forces in the global economy. Accordingly, there is an ever-growing literature that studies the sources of economic development in these two countries, comparing and contrasting their experiences over the past 30-40 years.¹⁸

China and India have differences in their structural transformation experiences. Growth in China has been described as manufacturing-centred, whereas in India it is more service sector-led. Goel and Restrepo-Echavarria (2015) pose these questions for future research: (i) Why is India's structural transformation following such an unusual path? (ii) Is the cause a stagnant manufacturing sector or an exceptionally productive services sector? Such questions will keep researchers in the field of international economics busy in the coming years.

QUESTIONS TO THINK ABOUT

1. Can differences in sectoral productivity growth rates account for the differences in sectoral reallocation of labour in China and India?
2. What would have happened to GDP per capita in India (Figure 2) if India had exhibited the Chinese sectoral labour productivity growth rates?
3. What are the aggregate consequences of structural transformation for economic development?
4. Can India leap ahead to overtake both China and the US in the near future?

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18. See, among many others, Bosworth and Collins (2008), Hsieh and Klenow (2009) and Bardhan (2010) and the references therein.

Commentary on the New Zealand economy

Alan King

alan.king@otago.ac.nz

	Sep 2017	Jun 2017	Mar 2017	Mar 2016	Mar 2015
GDP (real, annual growth rate, %)	2.7	2.8	3.0	4.0	3.7
Consumption (real, annual growth rate, %)	4.3	4.5	4.5	3.6	3.2
Investment (real, annual growth rate, %)	3.6	4.6	5.1	3.2	8.8
Persons Employed (full- and part-time, 000s)	2593	2537	2539	2402	2354
Unemployment (% of labour force)	4.6	4.8	4.9	5.2	5.4
Net Migration (year to date)	70,986	72,305	71,932	67,619	56,275
Consumer Price Inflation (annual rate, %)	1.9	1.7	2.2	0.4	0.3
Food Price Inflation (annual rate, %)	2.8	2.0	1.6	-0.4	1.2
Producer Price Inflation (outputs, annual rate, %)	5.3	5.2	4.1	0.1	-2.5
Producer Price Inflation (inputs, annual rate, %)	4.3	4.7	4.2	-0.9	-4.0
Salary and Wage Rates (annual growth rate, %)	1.8	1.7	1.6	1.6	1.7
90-day Bank Bill Rate (% p.a.)	1.95	1.95	1.98	2.43	3.63
10-year Govt Bond Rate (% p.a.)	2.91	2.76	3.27	3.02	3.30
2025 Inflation-Indexed Bond Rate (% p.a.)	1.67	1.51	1.91	1.97	1.77
Lending to Households (annual growth rate, % [1])	6.6	7.6	8.7	7.4	5.0
Real Exchange Rate (trade-weighted index [2])	74.6	76.8	75.5	71.0	77.6
Exports (volume, annual growth rate, %)	0.0	-2.1	-2.4	-1.3	1.5
Imports (volume, annual growth rate, %)	3.6	7.9	6.6	1.3	7.5
Terms of Trade (June 2002 = 1000)	1446	1435	1415	1330	1335
Merchandise Trade Balance (\$m, year to date)	-2908	-3657	-3709	-3765	-2372
Visitor Arrivals (annual growth rate, %)	8.6	10.2	8.9	10.4	7.1
Current Account Balance (% of GDP, year to date)	-2.6	-2.7	-2.9	-2.8	-3.5

Notes: [1] Housing and consumer loans made by registered banks and non-bank lending institutions. [2] Average index value over March 1985-March 2005 = 62.2.

Sources: Statistics New Zealand (stats.govt.nz), Reserve Bank of New Zealand (rbnz.govt.nz).

Growth slowed throughout 2017, but the economy's performance has been a little better than might have been anticipated six months ago. This is because of methodological changes and other revisions recently implemented by Statistics NZ to its GDP data series, the combined effect of which has been to lift the official measure of economic growth over the last two years.

The outlook for 2018 is for growth to continue, but it is unlikely to accelerate. This is in part because the dry summer experienced in many parts of the country will (ironically) have a dampening effect on agricultural production. In addition, the peak of the migration boom appears to have passed, and capacity constraints in the construction and tourism sectors are also likely to limit growth in the short term. It will also take some time for most of the new government's spending initiatives to take effect.

The upward revision in the official size of the economy and the recent discovery by Statistics NZ of a significant error in its measurement of internal income flows within the balance of payments has meant that the country's current account deficit (as a percentage of GDP) has been significantly smaller than first thought.

The current account records the country's international income and spending transactions. In simple terms, when the current account is in deficit it means we are collectively spending more than we earn – i.e. net national savings are negative and this needs to be covered by borrowing from abroad. However, as this includes investment spending (e.g., the purchase of new plant and machinery), current account deficits are not

necessarily problematic – especially when the future returns these investments generate can be expected to more than cover the cost of borrowing.

What the latest current account figures do highlight, however, is that New Zealand's deficit continues to remain at a low level historically. Since the Global Financial Crisis, it has averaged 2.9% of GDP and not exceeded 4% at any point. In comparison, the average over the ten years before the crisis was 4.6% and on two occasions a deficit of almost 8% was recorded.

What lies behind this change? The crisis may have made foreign investors less willing to lend to a small, poorly-diversified economy with a volatile currency. New Zealanders may have lost some of their appetite for debt-financed consumption, and local banks may have become more wary of feeding it, in the post-crisis era. Even the rising trend in our terms of trade (discussed in the previous Commentary) should have helped to make living within our means more achievable by boosting our international purchasing power.

New Zealand is not the only country to have become more conservative in its spending habits. Every OECD member nation with a record of moderate-to-large current account deficits pre-GFC – including Australia, the United States and the crisis-hit members of the Euro Area – have had similar experiences. In 2008, New Zealand's deficit of almost 7.7% was not particularly remarkable; it was only the eight biggest within the OECD. Ten years on, a deficit of even 5% has become a rarity in the developed world.

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