Vocational Education Research

Are we there yet? Building a research community to shape VET's future, AVETRA's Annual Conference, 28 April 2022

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I am going to start today with a remarkable fact: 200 years ago, 90 per cent of the world's population lived in extreme poverty. (Applying the World Bank definition of living on the equivalent of less than US $1.90 a day). Today, 10 per cent of the world's population lives in extreme poverty on that measure. And the world's population is 7 times bigger than it was in 1820.

And then there's a supplementary fact: someone in 1820 looking backwards would not have observed the same thing.

Perhaps for us, this is the more extraordinary fact – that for centuries, global average incomes did not really change. Living standards ebbed and flowed, rising and falling around a very low average, but in the scheme of things, life did not materially improve for the average person from generation to generation.

Yet today, global average incomes are 13 times higher than they were in 1820. In historical terms, modernity came upon us in a rush. And part of the essence of modernity is a mindset of progress and change which is not the historical norm.

I wanted to start with that context, not least because it frames many of the issues we are discussing here today about how we prepare people for a future where change is a given. And I promise to come back to the question of skills, vocational education and the importance of a vibrant and robust research capability.

But I am going to get there via some broader economic themes. In February, the Government issued Terms of Reference for the PC to undertake the second of its 5-yearly Productivity Reviews. One of the themes that we will explore is the role of skills, human capital and the various parts of our education system that contribute to productivity and growth, which is my avenue into these issues today.

It is early days for us, and when it comes to skills policy, I am going to pose more questions than I will provide answers. You know the answers better than I do; and in a sense the whole point is the importance of ongoing research, evaluation and professional curiosity are so important and highly valued.

Productivity can sound very esoteric and abstract, so I want to make it a little more concrete. Consistent with my opening, you can think of productivity growth as the story of human progress. Given yesterday's CPI release, it is useful to think about the issue through a cost of living lens.

One way we like to think about this is ask: for a worker on the average wage, how long does it take to earn enough to pay for various goods and services; and how does this compare to the average worker in 1901.

For example, in 1901 it would take the average worker 20 minutes, working at the going wage, to afford a loaf of bread. Today, it takes the average worker just over 5 minutes. So that's 15 minutes that can be spent working towards other things. To afford 600 grams of soap, it would take half an hour in 1901, today: more like 4 and a half minutes. A pair of shoes: 24 hours in 1901; an hour and a half today.

You see the point: in material terms, a modern worker can afford things by Monday lunchtime that an average worker in 1901 would have spent the whole week and more to afford.

There is also a quality dimension. The shoes purchased in an hour and half today are much better than the ones purchased in 1901. And on top of that there are all the new things that were unavailable (and many unimaginable) to the average worker in 1901 but which are commonplace today: cars, antibiotics, air-conditioning, television or the smart phone.

When we talk about productivity, it is really the effect of all these things brought together: that is, the overall rise in material living standards. When we talk about productivity growth, it is our (imperfect) attempt to measure that change over time and across countries. So we roll up all those individual changes as best we can, into an aggregate measure like real GDP per hour worked.

The reason that global statistic is imperfect is that many of the components are hard to measure (like quality, or the impact of new inventions); but it tells you something. For example, an important part of the dividend has taken the form of working less. We calculate that the average full time worker today works 40 per cent fewer hours than was the case 150 years ago, for an income which is 9.5 times higher.

This is true even when we look to the more recent past. Here is one way we look at it: think of the average real income of someone in 1980. Applying that same methodology, and using our admittedly imperfect aggregate measure of real incomes over time: how long would you need to work today at the average wage in order to achieve the same standard of living as someone in 1980?

You can debate how real this is, but at least on the official numbers, the answer is quite stark: you could reduce hours worked by 76 per cent, and have the same measured standard of living. In fact, average working hours have reduced by 13 per cent, spread out over a larger number of people in the workforce.

That might tell us something about relative trade-offs. We have (collectively) taken part of the dividend of higher living standards in the form of less work, but even more of it in the form of higher consumption.

Is that a bad thing? It mainly reflects relentless human ingenuity in identifying new ways to improve the lives of others, which take the form of new products and services which are useful. It might also be a way that people fund a longer retirement – given greater life expectancy – and also a longer period of time in formal education.

But my main point is that we can sometimes get lost in the abstract macroeconomic aggregates, but it is important to remember that we are really talking about that multitude of individual concrete things – the everyday items that take less time to acquire, the things that get better, and the new things that someone has come up with, that we didn't have before. If our measures were more comprehensive, they would also capture how much less we deplete natural resources over time.

The American economist Arnold Harberger, in his presidential address to the American Economic Association in 1998 talked about what he described as the 1,001 different causes of economic progress, and he asked the question: what does the growth process look like?

On his analogy, does it resemble yeast, or mushrooms? Yeast involves a fairly even expansion like bread rising across a broad surface; Mushrooms involve lots of little things popping up in unpredictable ways at random places and different heights.

He made the point that the growth process looks more like mushrooms than yeast. It is an uneven process, in which individual firms and sectors of the economy move ahead via a specific innovation, new technology or a new business model. Sometimes its brilliance, sometimes luck (perhaps a fortuitous discovery) and often a combination of the two.

Contributions to productivity growth can be highly concentrated in a particular industry, and as Harberger noted: "these industries also were very different as one shifted from decade span to decade span."

This can be obscured when we talk about an overall aggregate rate of productivity growth in the economy, which can imply that there is a single, general source of productivity growth. In one sense, we can say it's all about ideas – and this is right – but of course new ideas are serendipitous, idiosyncratic and therefore unpredictable – they don't occur according to a stable, predictable pattern.

Ironically, if we had to identify a general cause, its partly the very unevenness of growth itself. The fact that different firms and sectors innovate and improve at different rates is what drives the average performance forward: as an individual firm tries a new thing – maybe it stumbles on an innovation – it succeeds and grows. Others emulate it, often imperfectly, which creates yet more experimentation.

So, in an unconscious, collective way, we retain and expand what works, and jettison what doesn't; and through that haphazard process of trial and error, the economy as a whole inches in the direction of the extraordinary economic progress I described. This process of diffusion relies on economic dynamism – a degree of experimentation, and adaptability, the ability of people and capital to move and gravitate towards opportunities, all supported by robust institutions. An important question is how well that machine is working to generate, test and then spread new ideas across the economy.

In non-market and quasi-market settings – you can think of VET delivery being those categories – an important mechanism is the community of researchers and disseminators of evidence, who can identify good practice and guide participants in the direction of better outcomes.

The unevenness of productivity growth can have other consequences. One potential consequence is associated with economist William Baumol, writing from the 1960s onward. He pointed to the significant productivity growth that had been achieved in developed economies in areas like agriculture and manufacturing, largely through the adoption of labour-saving machinery and the application of science: things like fertiliser, pesticide, cheaper energy, better materials, the production line, interchangeable parts and the like.

Agriculture is the most stark example. In 1900 US agriculture employed 40 per cent of the workforce – some 12 million people, along with 22 million animals. Today it is less than 2 per cent of the workforce – around 2 million people and 5 million tractors. Producing vastly more output and increasingly, using less land. That freed up large number of people to work in other areas – fulfilling different needs. (Less sure what happened to the animals.)

But not all the sectors they 'went into' experienced the same transformation – not surprisingly. It's a hard story to emulate.

To the extent that rapid productivity growth in some sectors frees up labour and reduces cost, it *can* mean (depending on some assumptions about the responsiveness of demand to price falls) that both labour and consumer spending gravitate towards other sectors where it has proven harder to achieve productivity growth.

So, in contrast to my earlier point about the unevenness of growth driving the economy forward, Baumol pointed to one way in which the unevenness of growth can create it own headwinds. He pointed to some service sectors, ones which are labour intensive and where it is hard to make gains through automation – the string quartet was his canonical example: you always need four people, however technologically advanced society becomes – which he foresaw could make up a growing share of the economy and in which it would prove difficult to achieve further productivity gains.

By this process of 'unbalanced growth', or 'cost disease', the very process of automation would drive resources into sectors in which, by their nature, it has been hard to achieve the same big productivity gains as saw in agriculture, for example in the 20th century. Could economy-wide productivity growth thereby run out of puff? There is nothing inevitable about this outcome. But in a way, it frames the challenge and the opportunity.

The services sector now makes up over 80 per cent of the Australian economy. The path of innovation and the diffusion of new ideas that lead to productivity growth, could look different to the way these things unfolded in goods sectors like agriculture and manufacturing. Maybe it won't involve the same large scale replacement of labour with capital. Maybe it will rely more on the quality of human capital. And also on emerging digital technologies, artificial intelligence, better use of data, which complement labour.

What does this mean for skills?

In a fractal-like way, the trend that William Baumol pointed to across the macro-economy is mirrored in individual occupations. More and more we are coming to understand that automation does not primarily replace jobs, but rather it tends to replace tasks within jobs.

As with Baumol's point about the economy, as individual tasks become more productive due to automation, we spend less time on them and more time on the things that are hard to automate. This can be because job tasks are completely separable, in which case a time saving on one task creates scope to spend more time on other things.

Ironically, the better we get at one thing, the more time we spend on everything else. It can also be because tasks combine inputs – so that technology is a complement for some human skill that is combined with it to improve the overall quality of the output.

It means that humans are increasingly focusing on what humans do best, which is why commentators talk more and more about social skills, critical thinking, collaboration, creativity, synthesis, adaptability as being increasingly important.

This is consistent with a recent paper on the *Evolution of Skill Use Within and Between Jobs*, by Cavounidis, Dicandia, Lang and Malhotra, which finds that as technology makes some skills more productive, we use *other* skills more.

Consultants AlphaBeta have estimated that, on average, Australian workers are spending 2 hours per week less on routine tasks due to automation, freeing up more time to be spent on non-automatable tasks involving inter-personal skills, creativity, decision making and information synthesis. Importantly, they estimate that of this average shift in time spent, 71 per cent comes from people changing the way they do their existing job, rather than changing jobs. They point to teachers spending less time recording test scores and more time assisting students; sales assistance spending less time scanning items and more time helping customers. A routine task giving way to an inter-personal one.

The National Skills Commission has identified the 4 C's: care computing, cognitive and communication as core competencies that are increasingly required in the modern economy. They created an innovative 'automation index' – again, based on tasks within jobs – and identify the very trend we would expect: as automation occurs, the average automatability index across the economy actually falls (from 2.9 out of 4 in 2000 to 2.79 in 2020) – suggesting that resources are gravitating towards those tasks that humans do best.

Given that technology is primarily a complement to, rather than a substitute for, human input, it is an open question whether someone is better off in a job with *some* scope to automate tasks rather than none at all. Either way, the point is that jobs are becoming less routine, which has implications for skill formation

Most obviously, the ability to work with technology is an important enabler. Many of these digital technologies are ubiquitous, rather than occupation or industry specific. Digital skills are a form of infrastructure – if they are widespread, this creates a common platform for a lot of business innovation.

Also, occupations shift away from automatable tasks, it poses the question: how do we get productivity improvements out of the non-automatable tasks? How do we get better at them?

One channel is developing better skills in those uniquely human elements of the job. In many cases, that means more formal qualifications. The NSC estimates that 9 in 10 new jobs in the next 5 years are projected to require post-school qualifications.

Since 2000, they note a large shift in the skill composition of the workforce in favour of people with a Bachelor degree (up from 26 per cent to 32 per cent of the workforce) and a decline in those with high school or certificate I (down from 20 per cent to 16 per cent).

But some soft skills are hard to teach. US economist David Deming has illustrated the growing importance of social skills, noting that high paying jobs increasingly require social skills and that these are an important complement to cognitive ability. He finds a clear negative correlation between the social skills intensity of an occupation and it's routine-ness.

He also finds that the returns to maths skills are significantly increased if maths is combined with social skills. He notes that, particularly in service interactions, there is a sense of joint production between the worker and

the customer: the service is bespoke, individualised. It's quality depends critically on the ability of the worker to 'read' the customer and respond.

But much of this is based on tacit knowledge. How do we teach it?

Another key question is determining the right mix between full qualifications, short form training and informal training. In an economy where much of the change in skill requirements is happening within jobs rather than between jobs (and sectors), what is the best form of training to meet that need? Who should procure it and who delivers it?

Our review of the NASWD noted that around 60 per cent of Australian workers were engaged in unaccredited learning, with 15 per cent working toward a formal qualification. Formal training for people under 44 was primarily motivated by the desire to increase job prospects, whereas 90 per cent of work-related training was, understandably, motivated by 'increasing skills for the current job.'

Employers' direct use of the VET system was falling, though it isn't clear whether this is partly due to changing sectoral composition of the economy. Employers have the highest satisfaction for training provided by non-RTO providers, but perhaps this is unsurprising, given the nature of employer-funded training is likely to be more focused on immediate business need. Mid-career workers were less likely to use subsidised VET courses (partly due to eligibility) and also less focused on credentials, though they had some desire for micro-credentials. Some of this need would be being met through the VET system via skill sets, which now make up about half of non-AQF enrolments in VET.

Can aspects of this eco-system be improved?

In principle there is nothing wrong with having a variety of choices, some of which sit outside the formal qualification system and some within – and some perhaps in the estuarine environment in between.

My reading of Peter Noonan's review of the AQF argued against the extension of the AQF to micro-credentials, but argued for a more streamlined interface in terms of credit recognition where students move into the formal stream.

How should VET respond to all this? By moving closer to meeting business needs, or by leaving that to a different segment of the market? Is there a distinction between the natural role of public and private providers? Another question relates to the boundaries between VET and higher education.

Our own research on the demand driven university system focused on the 'additional' students who went to university as a result of that system – effectively a synthetic cohort of students constructed using statistical techniques, which allow us to draw some conclusions about who they are and how they fared.

In some respects they were a very different cohort – 73 per cent of them had an ATAR less than 70 (compared with the comparator cohort, in which only 28 per cent had an ATAR below 70). 30 per cent of them had done some VET, compared to the comparator of 10 per cent.

Compared with other students, these so-called 'additional students' were more likely to drop out, but of those who graduated, they were just as likely to be in full time work and their graduate salaries were roughly similar. Would they have done better in VET?

We tried to compare these students with other students who had similar characteristics but who went through the VET system. That analysis suggested – very tentatively – that those in the VET system were more likely to end up in full time work and had higher pay, a few years after graduating.

Of course the challenge is to judge these things over the full life cycle. As we showed, the earnings premium is higher for higher ed than for VET (though this isn't correcting for the student cohort), though it has fallen in recent years. Importantly, the earnings premium for higher education continues to rise with age, peaking in a worker's 50s, whereas the VET premium is flatter over the life cycle.

Of course, the boundaries between higher education and VET can be blurred, and they are an imperfect proxy for the distinction between vocational and generalist education. Universities teach a number of vocational subjects; and the VET system does a lot of generalist training, including in foundation literacy and numeracy.

Overall, do we have the balance right between generalist vs occupation-specific training? Again, David Deming looked at this issue in the context of STEM careers. His general finding is that if technological progress is rapid, then the optimal training mix shifts in favour of general over occupation-specific training, since there is greater obsolescence in the latter, whereas strong generalist education facilitates ongoing learning.

STEM occupations in particular attract a high initial earnings premium, but also have high rates of change in the underlying subject matter, so it is hard to maintain that earnings premium over a full working life.

Whereas in another paper, the age at which the average American worker hits their peak earnings has shifted from the late 30s in 1960 to their mid 50s today. He attributes this to the growing importance of decision making skills in the modern workplace – skills which are honed over time and rely on experience (as well as underlying cognitive ability) as a key input.

The observation that the average worker's value peaks later in life is interesting to ponder. Does it suggest anything about the mix between initial and lifelong learning? One thing it does seem to imply is that a lot of knowledge resides within people, which is only imperfectly transferrable. Unlike machines, we can't save it on a memory stick.

Our great challenge over the centuries has been to invent a different sort of machine – a set of social, cultural, economic and educational institutions to transfer knowledge from person to person as efficiently as possible. Hence the importance of the vocational education research community.

As I promised – more questions than answers.

The big point is this: we spend a lot of time debating the mechanics of the system, but we also need to lift the gaze and ask, in light of the changes around us, what should our overall system look like.

How do we best prepare workers and citizens for a world that requires us to combine the emerging technology of the modern day with the distinctly human traits evolved over thousands of years.