

Submission to the Productivity Commission of New Zealand
on their Issues Paper
in their
Inquiry into Technological Change and the Future of Work

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Summary

Two major trends are discernible in the diffusion of new technologies over the last three centuries worldwide (and 150 years in NZ), and these trends are likely to persist for the next few decades at least. The trends have had two major effects on the nature of work, and again, these effects are likely to continue developing over the foreseeable future. The broad outlines of suitable policy responses specifically for technological innovation's effects are fairly clear, and not dependent on any likely variation in the cadence of technological change, but the details depend somewhat on whether domestic wellbeing is preferred over gains in total GDP or vice versa, and what self-conceptions are considered to be components of wellbeing. Policy should be considered while viewing NZ and its economic activity as a complex adaptive system; therefore, effective policy responses to technological change will not be confined to traditional "work force policies" such as immigration, but will span the majority of government's roles and areas of action. The policy situation is also clouded by exogenous factors, such as the need to transition away from fossil fuels within the next few decades. Policies about inter-policy priority will be needed.

Preface

Impositions on the Reader

I do not have the time to prepare a properly referenced, fully explained submission, so I will have to impose on the reader's good will and willingness to recall prior learning and to perform internet searches to learn about topics that I mention with which the reader is unfamiliar.

I assume that the reader is aware of background economic ideas including the gravity model of trade, comparative advantage, the three-stock model of the working-age population, the Solow-Swan growth model; von Thünen's and A. Weber's core-periphery (transport cost minimisation) model; also of Michael Polanyi's ideas about tacit knowledge and the "new economic geography" of agglomeration effects; of Arrow-Uzawa-Romer endogenous growth models; of the ideas of network effects and "winner-take-all" or "superstar" markets; of monopoly, monopsony, economic rent-seeking and public choice ideas; of some of the recent popular economics literature such as Robert Gordon's *The End of American Growth* and Thomas Piketty's *Capitalism in the Twenty-First Century*; of microeconomic and game-theoretic ideas such as moral hazard and coordination failures; and of popular discussions of impending technological change such as Frey and Osborne's sensationalist 2013 paper.

Also due to my lack of time to prepare and revise this paper, I may well leave large gaps in the reasoning and/or omit important warrants in my discussion below. I ask that the reader attempt to fill in the gaps before dismissing my comments out of hand.

I apologise for these impositions.

About Me

I work as a knife hand in a meat processing plant in Hawera, Taranaki. In a former career, I worked as a systems analyst. I have had a long-standing interest in the nature and causes of productivity; however, I operate in an intellectual vacuum, so my thinking may be misguided. I will leave evaluation of that to the reader: feel free to imagine this paper written in a crabbed hand in green ink on onion-skin paper if you so wish.

As well as the suite of concepts and models listed above, my thinking has been influenced by Forrester's system dynamics, particularly the variant taught by John Sterman at MIT, and by a somewhat jaundiced view of organisations and organisation theory such as is expounded in Chris Grey's *A Very Short, Fairly Interesting and Reasonably Cheap Book About Studying Organisations*. I am aware of gaps in my knowledge in the areas of human geography, sociology, anthropology, history (particularly of NZ), psychology, and the more technical areas of economics¹. I hope that these gaps have not led me too far astray.

Technology Trends

The two trends or perhaps themes that I referred to in the Summary are: improvement in transport and communication, and substitution of muscle power with mechanical power, and the subsequent reification of physical-object oriented service labour.

¹ I have a B. Sc. in Mathematics (logic and abstract algebra, specifically). It has taught me to notice when the use of mathematics is unwarranted because of untenable assumptions (axioms) and logical lacunae between axioms and theorems. It has also taught me that mathematical statistics is very difficult, and novices and even moderately skilled practitioners almost invariably go astray with confidence, generally because of logical failures; I don't have the time to gain the necessary proficiency. (Please do not quote George Box's facile observation about models at me. Wrong models are worse than useless.)

Transport and Communication

Beginning with the development and diffusion of canals in the 16th-18th centuries, continuing with railroads and macadamised (and later tar-macadamised) roads, advanced sailing ships, steam ships, telegraphy and telephony, one major trend in technology has been improving the capacity, reach, speed, cost, and availability of transport and communications.

This trend is continuing right now, and will continue for the next decade or two with the diffusion of digital radio: for geolocation (GPS), for interpersonal communication², and for machine-to-machine communication for instrumentation and control purposes³. (The latter development is commonly referred to as the "internet of things".)

Machines and Methods

Jethro Tull's seed drill (1701) and Andrew Meikle's threshing machine (1786) as well as a host of developments in breeding, drainage and irrigation, improved ploughs and other machinery, and the use of water and wind power, and later fossil fuels illustrate the other major trend: the substitution of human or animal muscle power with inanimate power for moving, manipulating and transforming objects and materials, and refinement and standardisation of methods for working with physical goods.

² Mobile phone technologies such as GSM, WCDMA, etc.

³ Mobile phone technologies again (GPRS/EDGE, successors HSPA/HSPA+, and "5G") and low data rate, low power, long range technologies such as LoRa, IEEE 802.11af, ah, and 802.22; and technologies such as RFID chips and implantable radio sensors.

Consequences

Transport-Derived Urbanisation

The most obvious effect of improvements in logistics and communications is geospatial concentration of work in cities. This might seem paradoxical, but is explained by the fact that as costs fall and speeds and availability rise, previously insignificant differences in cost or time become significant. The growth of peripheries from perhaps 200 km radius around a core in von Thünen's day to 12,000 km radius today (increased 'reach' of transport) also helps this process.

Here is a concrete example. In NZ, the introduction of the milk tanker truck in the 1960s led to a wave of depopulation of dairying areas in the 1970s and 1980s, with formerly rural households moving into the cities. The milk tanker greatly increased the catchment radius of dairy factories. The resulting intensification of competition led to most of them closing, and their staff moving to cities.

The diffusion of other innovations such as the herringbone milking shed, and latterly the rotary shed, and improvements in agricultural machinery (hay balers) and fixtures (electric fences, road underpasses) further reduced requirements for labour on dairy farms and so continued the geospatial concentration of work and households in cities.

Future Rural Communication

In the foreseeable future, the combined application of digital radio technologies and supervisory control and automatic data acquisition (SCADA) instrumentation techniques (borrowed from indoor factories), possibly combined with diffusion of semi-autonomous mobile agricultural and

horticultural machinery, promise to create a further wave of rural depopulation over the next few decades.

Policy responses to this development need careful thought. I do not believe that policy is necessarily sensitive to the speed of diffusion of these innovations.

Mechanisation-derived Urbanisation

Alongside the diffusion of improved transport and communications, the diffusion of mechanical substitutes for muscle power greatly reduced the rural labour force. Most of this process had played out by the time NZ was colonised by the British from the 1840s to 1900 or so. However, improvements in truck design and the adoption of the shipping container, again starting in the 1960s, also contributed to the movement of work from rural areas to cities.

Mining to Marketing

Mechanization had another effect on work, which can be broadly conceived of as a displacement of “thing-oriented” labour, involving the movement and transformation of physical materials, by “people-oriented” labour, aimed at inducing behaviours, beliefs, or emotions in consumers: jobs changing from farmer, miner or sawyer to pharmacist, marketing manager or sales clerk.

(Obviously thing-oriented labour has not entirely disappeared--I still do it--but as a proportion of total labour hours it is greatly reduced from its dominant position in the early nineteenth century.)

In parallel to the displacement of thing-oriented work in the workplace, many domestic services, formerly part of the paid labour economy, were also mechanized. The services of laundry maids were replaced by water and wastewater pipe networks, electric water heaters, and electric

washing machines. Similar changes took place in kitchen work (piped water again, refrigerators and freezers rather than preserving), general household cleaning and maintenance (vacuum cleaners, flush toilets, baths), and the provision of entertainment⁴ (radios replacing reading aloud or singing)⁵, to list just a few services. This substitution has been called reification of services, and the devices reified services.

Future Work

Again, the movement from thing-oriented to people-oriented work is likely to continue for the foreseeable future. It seems possible, even probable, that reification will expand into the provision of health care, with the current development of devices for early diagnosis of illnesses⁶, management of chronic conditions, and improving wellbeing of pre- and post-working-age people. In the longer term, “gene therapies” may provide cures for many congenital, auto-immune, and idiopathic illnesses, greatly reducing the need for service work assisting and treating sufferers.

In my view this area is a high priority for policy development, given our demographic trends and the significance both of health care as an economic sector, and the effects of ill health on productivity and wellbeing throughout the economy and country.

⁴ Domestic entertainment was not usually part of paid labour, but it definitely contributed to household wellbeing and was probably considered work, given the alacrity with which it was abandoned once reified alternatives appeared.

⁵ The distinction between labour that contributes to GDP and unpaid domestic production is contingent and arbitrary. The most important (in the long run) in-home work is more or less completely unpaid: the socialisation of young children. GDP-included production would crash if this work ceased to be performed.

⁶ Despite the high-profile fraud of Theranos, real progress is being made by researchers in Israel and the US in the development and manufacture of smart-phone-attached breath analysis devices and microfluidics based multiple-diagnostic blood analysis devices, as well as cheap devices to diagnose vision and hearing problems. Consumer-operated devices for monitoring hypertension and diabetes are widely available, and heart rhythm monitoring devices are starting to appear. Many devices for the in-home management of dementia are also appearing.

Of lesser potential impact and further out in terms of diffusion, the development of autonomous road-going vehicles for goods transport and public passenger transport may reduce the (already small) part of the workforce engaged in transport services.

I mention this topic because it has been the subject of a pseudo-innovation, and I would like to take a few paragraphs to discuss that.

Pseudo-innovations: the case of Uber⁷

It is common to the point of nausea for Uber to be mentioned when talking about imminent technological innovations. However, Uber has innovated not technologically but politically.

Let's look at the facts.

Uber, whatever it may say, is in the business of providing passenger transport to individuals and small groups⁸: it is a taxi company.

Other taxi companies are subject to strict regulation, for passenger safety reasons⁹. Uber has set out to systematically evade these regulations in all of the markets in which it has attempted to operate.

In addition to (often successfully) evading public safety regulation, Uber has systematically shifted its business risk onto its workers, by reclassifying drivers from employees to independent contractors and avoiding paying them during periods of slack demand.

⁷ My reasoning has been reproduced by others, strengthening my confidence in my conclusions. See, for example "Uber's Path of Destruction", <https://americanaffairsjournal.org/2019/05/ubers-path-of-destruction/>.

⁸ Consumers wishing to use Uber's services make contact with Uber, not with its drivers directly. The relationship is between Uber and the consumer.

⁹ Public Choice theorists would say the regulation is demanded by taxi companies themselves, to create barriers to entry into the market. There may be some truth in this, but the public safety argument is much stronger.

Despite these evasions, Uber has lost very significant sums of money ever since starting operations about ten years ago. The reason for that is its pricing: it is pricing its services well below its own costs, and below the prices of its competitors. This is called predatory pricing, and in the past it was cause for legal action by commerce regulators.

From another perspective, Uber has tried and failed to enter major markets, including China, India, and Indonesia. These failures show that there is no technological innovation that provides Uber with significant competitive advantage.

Uber cannot make a profit, so it will go out of business when its investors lose patience.

Meanwhile, Uber persuaded “public opinion” that it is doing something magical with technology, and its founders and early backers have used that belief to sell shares in the company to an uncritical investment public. This is reminiscent of the famous “pump and dump” stock market shams promoted in the United States in the late nineteenth century through to the 1920s.

The attention that Uber has drawn from policy-makers has had counterproductive effects on policy. The belief that Uber provides efficient transportation (it does not) has reduced enthusiasm for expanding, or even maintaining, public transport in many cities. Uber has no interest in connecting to public transport¹⁰ and probably wishes to discourage its use.

Uber and Policy

Uber is not alone. Theranos, and the promoters of blockchain are two other high-profile pseudo-innovators--Theranos was outright fraudulent, and no use has yet been discovered for

¹⁰ Jarrett Walker 2019, “Do Uber and Lyft Want to Connect to Transit?” <https://humantransit.org/2019/04/do-uber-and-lyft-want-to-connect-to-transit.html>

blockchain besides “cryptocurrencies¹¹”, despite years of promotion by McKinsey, Gartner, Goldman Sachs, and their ilk.

The issue of pseudo-innovation seems to require a policy response. Commerce regulators (MBIE in NZ) would ideally take a proactive stance in rapidly evaluating claimed innovations, and may need enhanced powers to regulate in advance of the issues working their way through Parliament. A corps of investigators may be an appropriate policy response, or it may be possible to bring together ad-hoc groups to make determinations.

The Interactions of Policy

The reader may well be thinking at this point that my suggested policy responses so far are not labour policy, and therefore out of scope for the inquiry. As mentioned above, my perspectives are influenced by system dynamics.

System dynamics theory holds that in a complex adaptive system, such as an economy, it is not possible to draw hard boundaries between the parts of the system, or to make changes in one part of the system without provoking a--often unexpected--response in other parts, that--often--neutralise the original change, or make things worse.

From this perspective, all economic policy and a good deal of social policy (health care, education, social support) is workforce policy, as well as being industrial policy, tax policy, transport policy, urban design policy, environmental policy, and other policies besides. Therefore

¹¹ Cryptocurrencies are more accurately named “digital collectibles”. They do not have any of the core characteristics of currencies, but have some resemblance to Star Wars figurines in original packaging and obsolete postage stamps, in that some people will pay for them, and prices are volatile depending on sentiment. Also note that the production of cryptocurrencies has low productivity and large externalities by design.

I urge the Commission not to restrict its recommendations to what is traditionally thought of as workforce policy.

The Broad Outlines of Policy Responses

Background

Recapping, we can expect the long-run trends of urbanisation (and urban densification¹²) and of reification of thing-oriented services, and the displacement of labour towards people-oriented work to continue much as they have done over the last century or so--perhaps faster, perhaps slower, but the direction is fairly clear.

Exogenous factors (from a labour force point of view) need to be taken into consideration also. We know more or less what our demographics will be like, and we know more or less what we can expect to happen climatically and how our ecosystems will degrade over the next several decades. We also have some idea of what will happen with our major trading partners in these areas. Finally, we can expect one or more non-climatic disasters (tsunami, major earthquake, volcanic eruption) in the next 50 years.

We also have the problem of attempting to move off fossil fuels as soon as possible. Fossil fuels provide the majority of NZ's energy for very good (economic) reasons, so this process will very likely adversely affect productivity in the short run.

All of these things may take precedence over attempting to single-mindedly grow productivity, and each of them will affect household wellbeing in various ways.

¹² Time did not permit me to go into this in detail. My view of the required policy responses summarises as: we need a simplified zoning system with "as of right" (no "character preservation" or "viewshaft" objections allowed) redevelopment regulations in inner areas of our large cities in order to promote the densification that increases productivity; and in the long run to we eliminate cars, because roads lead to low-density cities, hurting productivity and wellbeing (as well as the environment).

Policy, Policy - Policy Policy?

Given these trends and this background, what policies do we need?

Firstly and most simply, there needs to be a conversation about the relative importance of productivity versus the preservation of rural population centres and services. Is our self-image as being connected to the land an important part of our well-being? More important than productivity and a higher objective standard of living?

We also need a conversation about policy priorities. If climatic shifts affect us adversely to a greater degree than expected, what priority should a response to that have? If, say, Papamoa Beach and Mount Maunganui are wiped out by a tsunami, should we rebuild them or move them elsewhere, given expected sea level rise? What about a volcanic eruption in the central North Island? In White Island, affecting Auckland?

Personally, I favour policies which foster robustness and resilience rather than efficiency or maintaining the status quo--especially now, given the looming shadows in our future.

Assuming that these matters are dealt with so that we have broad national agreement (inevitably, with dissenters), what do we do specifically in response to technological innovation?

Healthcare

I have discussed this above. The population is aging; shortly there will be as many people over 50 as under 25. Improvements in housing and nutrition and reduction in physical wear and tear from hard labour mean that many people would be able to continue working into their seventies, and perhaps eighties, if their health is maintained. Policies that enable rapid evaluation and rollout of new medical technologies and patient-operated devices would seem to be desirable for

both productivity and wellbeing reasons. Outsourcing short-stay hospital treatments (surgery, etc.) to countries that have economies of scale and lower costs could also be considered.

Education

The current structure of our education system is not well matched to the nature of modern work. Work that requires communicating with and influencing other people requires “soft skills” that can not “take” until the prefrontal cortex is fully developed, which happens in the early twenties. A suggested change to education, therefore, is to bring school leavers and those with level 4 qualifications back to school for a year in their mid twenties, to learn things such as active listening, effective communication, negotiation and conflict resolution, anger management, self direction, critical thinking, and similar skills that make up “emotional intelligence” (Goleman) and/or “executive function” (psychologists). Focusing this policy on lower socio-economic quintiles and, in particular, on thing-oriented people (i.e., males¹³) will probably pay the greatest dividends in terms of both productivity and well-being. (Avoided prison terms being one of the big wins, another possibly being a reduction in domestic violence. It may also help with NZ’s notoriously poor management skills.)

Evaluation and Regulation

As discussed in the cases of Uber, Theranos and blockchain above, there is a need for the capability to rapidly and actively evaluate and regulate claimed innovations, probably exceeding Parliament’s “top speed of legislation”. Delegation of powers to MBIE is recommended.

¹³ Probably the only cross-cultural commonality discovered so far by anthropologists is that males tend to be more “thing-oriented”, and females more “people-oriented”, in all cultures. Obviously these are overlapping populations on a continuum, so the differences are not categorical.

Working Time

If we are interested in growing productivity specifically rather than total production, reductions in the length of the working week and the working year will result in more output per worker-hour--they have already done so in France and in some other European countries. This would also improve domestic wellbeing, as French households consistently report higher levels of wellbeing than Greek ones. (Greece has long working hours and years, similar to NZ's.)

Thanks

Thank you for the opportunity to make this submission. I hope that the ideas and perspectives it contains prove useful in the later stages of the Inquiry.

Not Discussed

Rent seeking - both businesses and households; risk shifting ditto (except in passing); the disruption fad; management fads and the cults of managerialism and leadership; the AI fad; impending employer and insurer surveillance of households; the chilling effects of high inequality; prevention of downturns more valuable than occasional high growth; ditto focussing on the basics: literacy, numeracy, health and socialisation, vs. innovation parks and picking winners; the uses of social safety nets; universal basic income and its harms; the harms of social media; sedentism, its illnesses, their prevention and effects on productivity and wellbeing; work intensity increases vs. productivity gains; productivity of large vs small enterprises; specific responses to low (perceived) managerial competence; labour participation rates and marginal

productivity; NZ as an importer of technologies; NZ's high cost of funds due to household rent-seeking; the gloomy outlook forecast by the gravity model of trade.