



The Knowledge Economy...

no more business as usual

By Martin Richardson

Where a pessimist sees a sign reading “Trespassing prohibited. No swimming”, an optimist sees “Trespassing prohibited? No! Swimming!” Similarly, I mean the heading on this article to be read “The Knowledge Economy? No! More Business as Usual!”

Most people would probably see this as a pessimistic view. Actually, I will argue that it is fundamentally optimistic, at least from the perspective of countries such as New Zealand. ▶

The US economy expanded, uninterrupted, for more than nine years and only now is it slowing down

1 THE INFORMATION AGE

Information technology (IT), it seems, is the industry of the future. It is hard to pick up a newspaper (or click on a news provider's website) without being harangued on the inevitability and virtues of the New/Knowledge Economy paradigm.

- "The great IT race: NZ lags well behind Finland" ... *UABR*, #1 2000
- "Scientists call for action on New Economy" ... *Newsroom*, 3/4/2000
- "Internet sales could make Dunedin rich" ... *Otago Daily Times*, 20/1/2000

It's not just the media. Reports to governments, business leaders and academics make the same claims and sound the same alarms.

I'm hardly the first to be sceptical concerning "industries of the future". Indeed, there is a long history of economists' scepticism here. In the 1960s, heavy industry was the guaranteed route to economic growth; in the 1980s, having a RAM chip industry was the one true path; now it is IT.

An argument's status should not be decided by the company it keeps, of course, but these are strange bedfellows indeed.

While there is no question that technological changes have had – and will continue to have – a significant impact on the economy and the way we conduct business¹, the two big issues are:

- whether that impact changes the fundamental "rules of the game" of how the economy operates; and
- what the implications are for governments and national economic policies.

A number of terms have arisen to describe the effects of globalisation and technological progress on economies. I will use the (imperfect) distinction of applying the term "New Economy" to alleged macroeconomic

changes of recent decades and the "Knowledge Economy" to microeconomic changes.

2 THE "NEW ECONOMY"

2.1 Some numbers

Even sceptics must acknowledge that the recent economic expansion in the United States was highly distinctive. The US economy expanded, uninterrupted, for more than nine years and only now is it slowing down.

Historically, slowdowns have been signalled by slowing productivity growth, rising inflation and slowing investment. In the US in recent years, productivity growth has been rising, unemployment trivial and only now does the Federal Reserve see mild signs of inflation.

Why has this expansion been so sustained? Surely this is a brave new world?

Well, the present is always a poor vantage point for assessing its historical significance. Of course, the US economy in the 1990s "is very different from what it was in the 1950s, but the 1950s were very different from the early 1900s, and so on"².

The critical question is whether things have changed *in kind*. "New-paradigmists" say "yes" to this for three distinct, albeit related, reasons – all of which stem ultimately from globalisation and information technology (IT).

2.2 Business cycles

The first claim is that the business cycle has been dampened. The "natural rate" of unemployment has been reduced by globalisation (so domestic firms face stiffer competition) and IT innovations (permitting cost reductions and productivity improvements.)

Both of these are disputable. International trade is still only 15 per cent of the US' GDP, so the discipline of foreign competition hardly extends throughout the US economy.

¹While e-commerce in the US economy was only \$US150 billion in 1999 (in a \$9 trillion economy), it is expected to grow at 85 per cent or so a year for the next four years. See Altman in White House (2000).

²The next few paragraphs draw on Stiroh (1999).

Still, the big issue is how to distinguish between these alleged fundamental changes and more traditional sources of a decreasing natural rate. These include supply side factors such as generally low oil prices and sound fiscal policy (the US enjoying a budget surplus) and monetary policy (Fed Chairman Alan Greenspan refusing to choke the expansion.) Indeed, some have claimed that the whole New Economy has been a mirage due solely to low oil prices.

2.3 Structural change

A second argument made for the novelty of this expansion is that the US' potential long-run growth rate is permanently higher. The jury is still out on this. But let me point to a couple of interesting numbers.

The argument is that "IT fundamentally changes the way businesses operate" (Stiroh, 1999) and has led to quantum leaps in productivity gains. But what of the so-called Solow paradox, that the computer age shows up everywhere except in the productivity statistics?

At the micro(worker) level, some early studies claimed to find evidence that use of computers showed up in wages. A recent study (DiNardo and Peschke, 1997) found that, yes, controlling for occupation and educational attainment, the use of a computer by a worker was associated with a higher wage.

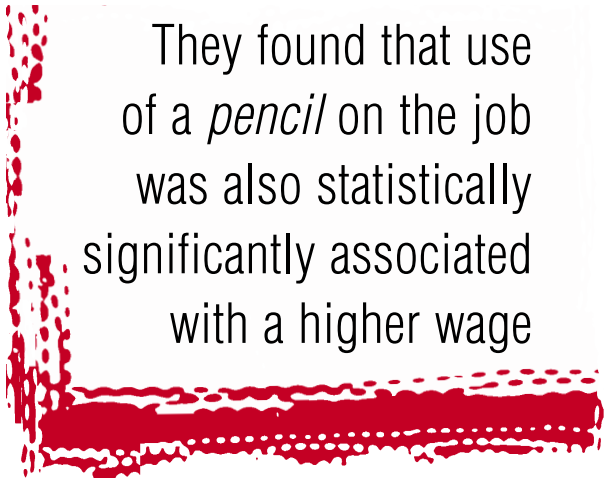
Controlling for the same things, however, they found that use of a *pencil* on the job was also statistically significantly associated with a higher wage, as was whether you sat or stood (sitting is better).

Their conclusion: these workplace tools are all picking up something else unmeasured. It is likely they just reflect a hidden selection effect.

What about the macro data?

- We did not see US labour productivity pick up until four or five years ago (even then, it has grown at only two to three per cent a year compared to 3.2 per cent a year for 1949-1973).
- This growth is concentrated in a few sectors (largely computer hardware), as even IT optimists such as Oliner and Sichel (2000) note.

- Perhaps IT does not so much *increase* output as *redistribute* it (cf. the dotcoms in recent years). As any business that has tried to add an "e" knows, massive costs are associated with it. And they are not just one-off costs either; upgrading is continuous.
- Recent productivity growth could be for "old-fashioned" reasons. For example, firms are surprised by high demand late in the business cycle (maybe due to wealth effects from the stockmarket) and, with low unemployment, they work their staff harder.




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Of course, New Economy pundits can marshal a lot of arguments here too:

- IT shows up in *quality* improvements, which are unmeasured.
- IT is concentrated in service sectors where productivity is poorly measured.
- It has taken time for IT effects to show up because of network economies.

Drucker (1999) argues convincingly that the internet is to the Information Revolution what railways were to the Industrial Revolution – the instrument of rapid dissemination. So it is the spread of the internet that is finally bringing the Information Age to productivity figures.

In sum, the judge is still out in this "trial by witness" although most of these arguments suggest to me a change in income *levels* rather than *growth*. We have a technological improvement, we grow rapidly as it is 

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absorbed, but then we adjust to a new steady state, perhaps? Time will tell.

2.4 Who cares?

This discussion on whether the old economic “rules of the game” still apply – or the view (see Galbraith, White House, 2000) that they never applied! – might simply be dismissed as professional touchiness. Actually, it is important. If the old rules still apply, then historical experience is relevant. And, as Uren (2000) notes, electrification, mass production and the advent of the motor age from 1910 to 1930 were followed by a fairly significant recession.

Maybe the IT age has smoothed out business cycles, but it seems very unlikely that it has removed them altogether.

While I think it is too soon to pass judgement on the New Economy, the next few years should provide good tests of its robustness. The alleged technology bubble may not have burst, but it seems at least to be leaking, Microsoft has run afoul of the US Justice Department and OPEC seems to have regained some temporary stability.

The third argument for “all is new” takes me into the Knowledge Economy. The sources of growth have changed, it is argued. Knowledge is the engine of growth and its generation is characterised by increasing returns to scale.

3 THE “KNOWLEDGE ECONOMY”

Twenty years ago, economists’ consensus view was that economic output came from the combination of factors of production – various forms of labour, land, capital and energy – and growth came from either factor accumulation or some felicitous technological progress that enabled a better combination of these inputs. (This is a fairly crude characterisation, as the roles of increasing returns, entrepreneurship, creative destruction and so on have long been recognised.)

Empirical work attributed growth to factor accumulation or an unexplained residual. “New” growth theory focuses more directly on trying to explain this residual – hence it is often referred to as endogenous growth theory.

New-paradigmists argue that a number of features of knowledge industries make them prime candidates to be engines of growth.

- 1 They are characterised by high fixed and low marginal costs, giving internal increasing returns to scale (steeply decreasing average costs as output rises.) To write the first copy of MS Outlook cost millions of dollars; the rest cost only cents.
- 2 There are network economies. A single telephone in a country is an ornament. It becomes an appliance only when there is another phone with which to connect. Furthermore, its value increases with the size of the network.
- 3 The generation of knowledge has inappropriability features, which lead to clustering and feedback circles.
- 4 Points (1)-(3) mean that market failures are endemic in knowledge industries.
- 5 Ideas are an inexhaustible resource.

None of this is new, of course, either to the real world or to economic theory. What is seemingly new is the *importance* of ideas and knowledge in the modern economy.

On the inexhaustibility of ideas, Bailey (2000) notes that environmentalists frequently do not seem to understand that consumers do not want oil, they want transport; they do not want copper wire, they want communication; they do not want paper, they want cheap information storage.

What transforms a *resource* such as plastic into a *product* such as a floppy disk is an extra input: an idea. So the finiteness of physical resources need not prevent unlimited economic growth.

It is true that this oversight of Malthus, the original doomsday environmentalist, still flourishes today. But – and here is my point – it is hardly *more* wrong now than it was in 1798. Ideas and knowledge have *always* been fundamental to the economic transformation of inputs into outputs. The fact that economists can now model that effectively does not represent an underlying change in the economy.

The evidence that there has been a sea-change in the *importance* of ideas and knowledge is no more compelling than that of a New Economy. My position on that, as noted, is that it is still too soon to say.

3.1 The Old Economy redux

Suppose we accept that there are increasing returns to generating ideas and that certain “industries of the future” are very idea-intensive. Does that make these “good” industries we should be encouraging?

Leaving until later the role of government here, I want first to examine this in a simple dynamic comparative advantage model based, very loosely, on Wong and Yip (2000).

Consider a model *à la* David Ricardo (1817) of a small country with one factor trading with a similarly structured rest of the world. Suppose there are two sectors – information technology (IT) and agriculture (A) – and the country will completely specialise in one of them.

In an economy closed to international trade, a nation would have to produce all it consumes. In a trading economy, however, there is a looser inter-temporal constraint. The value of a country’s production, at world prices, must equal that of its consumption.


So far, so standard – but there are two wrinkles to add. First, suppose there are constant returns to scale in A, but increasing returns to scale in IT, as an effect external to IT firms. The latter is our high-tech, idea-intensive sector and the more we produce of it, the greater becomes our *potential* production. (This is not to suggest that we have no such improvements in agriculture. But if they are greater in IT, nothing is lost by simply setting them to zero in A and thinking of the returns in IT as being the *excess* over those in A.)

If we concentrate in A alone, our production possibilities are unchanged over time. If we produce some IT, however, our production possibilities move out dynamically.

Second, this country is not alone in facing such potential gains. These “experiential” returns occur in all countries’ IT sectors. This suggests that the relative world price of IT will decline over time.

(Lest anyone doubt this, consider the price of computers and chips over the past decade. They have fallen so fast it has been said that *not* buying a computer is the best investment a firm could have made.)

We can now consider a number of possibilities, of which I shall look at three.

In the first – call it the “United States” case – the returns to investing in IT are great. (Perhaps the economy has a large domestic market with steeply increasing returns and it is a technological leader.) Specialisation in IT means an ongoing growth in output. And, even though the world price of IT is declining, it falls at a slower rate than US output increases. Overall, the US is better off specialising in IT rather than A. 

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Now consider the second – the “New Zealand” – case. Here there would also be growth in IT, but, perhaps for reasons of size or location, not as rapid as IT growth elsewhere. Thus the world price declines more rapidly than production possibilities move out. Income here is maximised by specialising in A.

Finally, consider a third case. This is where a country specialises in IT, but its growth rate is *less* than the decline in world prices, i.e. there are other countries where IT productivity growth is even greater. In this case, while consumption is growing, the country would

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nevertheless be better off specialising in A and benefiting from the declining world price of IT.

I shall call this the “Argentine” case for two reasons. First, the choice of many Latin American countries in the 1950s-70s was to pursue *import substitution* – replacing manufactured imports through high tariffs and industry assistance, with domestic production (a strategy that should sound familiar to New Zealanders).

These countries feared that the sectoral terms of trade facing primary commodities would decline over time. The consequences of that strategy were, famously, a slow but continual collapse in relative national income.

The second reason I call this the Argentine case is that ITAG's 1999 report (p3) to the New Zealand government, *The Knowledge Economy*, cites Argentinian experience: “The decline of a once-prosperous economy is known as ‘the

Argentine disease’. Although these days Argentina is considered to be a developing country, in 1929 it was as rich as any large country in Europe. Fifty years ago, New Zealand ... had the third highest per capita income in the world. Have we caught the Argentine disease? Why have we dropped so far? The answer is that New Zealand is still playing the game of commodity exports.” (No evidence is adduced for that last assertion, incidentally, and Cuddington and Urzua (1989) find no global evidence of a secular terms of trade decline for primary products over the 20th century.)

What is fascinating about this choice of label is that many feel Argentina's woes stemmed exactly from its denial of comparative advantage; its enthusiasm to be an industrialised “grown-up” nation.

Substitute in the latest “industry of the future” and this is precisely the course the authors of *The Knowledge Economy* have charted for New Zealand!

Incidentally, the implication of this model is not that New Zealand will never develop high-tech knowledge-intensive industries. Rather, it is that *forcing* that development through industrial policy may be a mistake.

3.2 Economic geography

The authors of *The Knowledge Economy* tell us “distance is dead”. The Cleopatra utopia put before us is that “our white-collar workers can compete ... with those in London or California. People ... will be able to work from wherever they choose to live. [I]n this new view, New Zealand is at the centre of the world” (ITAG, p7).

Personally, I think the rumours of distance's death have been greatly exaggerated.

Many managers would be well advised to strap themselves to the mast in the face of the siren calls of ITAG and others predicting the slow death of Old Economy business. Remember when telecommuting was going to change the face of business? Or the paperless office?

There is plenty of other indirect evidence that suggests the internet may not be such a globe-shrinker:

- International capital markets have been open for a long time and yet there are strong domestic biases toward domestic borrowing and lending. These biases may be perfectly rational: personally verifiable information is more reliable than second-hand information and the net does nothing to change that.
- International trade is a lot lower relative to domestic consumption than trade barriers and distances alone would suggest (Helliwell, 2000). Again, there is a home bias in consumption that is inexplicable in the global village. And while I can buy books through Amazon.com and the *transaction* is immediate, I still have to wait days for the things to arrive. Distance is hardly dead there yet. Indeed, as the wait turns into weeks, I sometimes think it is not even ill.

Why should New Zealand be a haven for information-based industries? To summarise many, many learned books and papers in half a sentence, a central focus of the New Economic Geography branch of International Economics is on the tension between locating centrally (to be where product demand and factor supplies are) and peripherally (where factors are cheaper).

How is this balance upset by the IT revolution? Well, not much. Suppose we allow that the internet really does render Dunedin at the centre of the cyberworld. It is important to recognise again the second aspect of our earlier model. Yes, the internet could make Dunedin rich, but it could also make Wollongong rich or Trenton rich.

Which is more likely?

Answer: distance matters. Temple (1999) stresses the distinction between “codified” and

“tacit” knowledge. The former can be written down and conveyed at low cost – blueprints, derivative pricing formulae and so on. The transmission of tacit knowledge, however, typically requires face-to-face interaction. Scientific methods or financial problem-solving might fall into this category.


Now, such knowledge is best thought of as a private investment as it does not have the inappropriability problems that can plague the generation of codifiable knowledge.

Temple notes two possible conduits for the transmission of such tacit knowledge. One is agglomeration or “clustering” of related firms. Silicon Valley is an oft-cited example in which technology firms cross-fertilise through frequent turnover. The other is internally within a firm that develops processes to internalise the “public good” nature of best practices and learning-by-doing.

How is all this affected by the IT revolution? Clearly, the transmission of codified knowledge is improved and this means that location in Dunedin or Wodonga or Peoria makes no difference.

However, this raises the *relative* importance of the transmission of tacit knowledge, which still gives an advantage to large countries and to large – perhaps multinational – corporations.

The death of distance applies everywhere (if it applies at all) and just brings into sharper relief the other aspects of locational choice. The Knowledge Economy may not weaken the incentive to agglomerate.

All of this will apply to a greater or lesser degree in different industries. Where tacit knowledge is unimportant, industries will be geographically 

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more mobile, and lifestyle and other attractions of New Zealand could be significant.

The notion I wish to dispel, however, is that all countries are somehow on an equal footing in the New Economy; that, in contrast to the Old Economy where resource endowments mattered, knowledge industries are all just “up for grabs”.

3.3 The role of government

The inabilities of governments to pick winners are pretty well known, so activists no longer argue for this directly. (Although in our earlier model, cases occur when the government can directly intervene for the better. If the country is specialised in A, but has high increasing returns to IT, then judicious protection of the IT sector can improve on continuous free trade. See Wong and Yip (2000).) Instead, government is called upon to create an appropriate “environment”. But by now taxpayers should have the Pavlovian response of putting their hands on their wallets when they hear this kind of thing.

Governments, of course, are enthusiastic to be seen to be helping out. “Look at Ireland” (or whatever the world’s best-performing small country is at the moment) the thinking seems to go. “They have a lot of IT. And does it ever pay off! (Think Microsoft, Nokia, Cisco Systems.) If we could get some of that, the returns would be fabulous!”

This is reminiscent of a Dilbert cartoon in which a manager observes that only one out of 10 R&D projects will succeed. “I recommend,” he continues, “cancelling the other nine.”

This focus on winners is not surprising, but it is a poor foundation for policy. It is analogous to investing New Zealand’s national income in the New Jersey State Lottery on the basis of the returns to a successful ticket. And what has worked for others – and I have yet to see any serious assessment of these “success stories” in terms of the *costs*, not just the benefits, of their policy choices³ – need not work for New Zealand.

This leads to a critical point. If there is one thing that distinguishes knowledge in the New Economy from that in the Old, it is that it is more firm-specific, more appropriable. When knowledge is treated as an economic resource,

it “can, and increasingly should, be seen as a *private* investment good” (Temple, 1999, my italics. See also *The Economist*, 8/4/2000). Hence the association of knowledge with “technology” rather than “science”.

The important implication of this is that if there really are fortunes to be made here, we would surely expect private firms to go after them. If, as we are told, a business’ failure to be knowledge-based is such a fast track to oblivion, why is it that government economic policy must be geared to steering business from that path?

As always, the only rationale for policy makers to throw other people’s money at this is if there is a clear, well-established and empirically known divergence between social and private incentives.

As in the Dilbert cartoon, policy makers always see that divergence *ex post*. But before New Zealand buys a ticket on the Knowledge Economy bandwagon, we should not only make sure it is the fastest way to get to where we want to be, but we should make sure we really need a fare subsidy from the taxpayers’ pocket to do it.

Interestingly, there is plenty of evidence that New Zealanders have taken up electronic commerce and adopted an extensive electronic infrastructure very readily in recent years, all in the absence of any strong governmental push to do so. Boles de Boer, Evans and Howell (2000) note that New Zealand does very well in international e-commerce comparisons. New Zealand firms and consumers seem to have found this path without being led to it by their government.

This is not to suggest that the government has no role at all. I have listed a number of reasons why information is rather a different good from boats or kiwifruit. They imply that governments may have an infrastructural and educational role, as Wilson (2000) suggests.

Certainly governments should not be *impeding* the uptake of technology. To paraphrase *The* ►

³To the extent that “perch yourself on the rim of a huge market that gives you preferential market access and pays you massive subsidies for your more inept sectors” can be considered a policy “choice”. Finland is a popular example currently – with a population only 30 per cent greater than New Zealand’s, it has become an IT success. This is all on the coat-tails of a single firm, however. Nokia-led Finland in the 1990s is rather like Abba-led Sweden in the late 70s, but nobody suggests basing a development strategy on mimicking that.

Economist (1/4/2000), governments are wrong to see IT as a substitute for economic common sense. "The world is changing, but not by that much."

CONCLUSION

None of my arguments suggests that policy makers should be completely immune to the Knowledge Economy. Many well-established arguments exist for keeping economies open and for encouraging education and science-business links. My point is that these arguments differ from those that have always prevailed only in extent, not in kind.

New Zealand's future very likely lies in the same place as our past: as wealthy exporters of primary and resource-based products.

Watson (2000) states that New Zealand R&D "is disproportionately skewed toward the agricultural sector". I would suggest there is nothing "disproportionate" about it and that enhancing our given comparative advantage through biotechnology and other agricultural R&D may be a very sensible strategy.

Our massive advantages in agriculture could certainly be reduced by technological improvements elsewhere if we were simply to do nothing. However, there are strong incentives for market participants to recognise this.

The undisputed importance of technology does not provide much of a window for governments to be heavily involved in it.



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FURTHER READING

Many economists have suggested that it is too early to accept all the assertions of a New Economy. Some careful – and optimistic – assessments are in Blinder (2000), Stiroh (1999), Oliner & Sichel (2000), *The Economist* (2000) and Temple (1999). Some claims for the effects of globalisation and IT can be found in Mendelowitz (2000) and ITAG (1999): a useful antidote is in Brown & Duguid (2000). From a New Zealand perspective, Kerr (1999) and Upton (1999) express some of the considerations of this paper.

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