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## Occasional Paper Series

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# **PRODUCTIVITY, CREATIVE DESTRUCTION AND INNOVATION POLICY**

**Professor John Foster  
February 2010**

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# Foreword

The Australian Business Foundation is pleased to provoke debate with the latest contribution to its series of Occasional Papers – *Productivity, Creative Destruction and Innovation Policy* by John Foster, Professor of Economics at the University of Queensland and President-elect of the International J.A. Schumpeter Society.

Professor Foster's paper proposes a model of economic growth where entrepreneurship, knowledge, technology and innovation are positioned at its centre, rather than as external peripheral forces. His prescription is for a more dynamic innovation policy aimed at making entrepreneurial activity the hallmark of old and new industries and large and small enterprises.

Professor Foster argues that this is the basis for surviving the forces of creative destruction and positioning Australia for a new long wave of productivity growth and innovation-led prosperity.

Fresh from the global financial crisis and with the long term challenges for services, living standards, infrastructure and cities presented by Australia's aging population, the need to lift Australia's productivity and the skills and contribution of our workforce is urgent. Professor John Foster's argument is for a fresh approach to innovation policy that is directly linked to enhancing Australia's productivity and that faces the reality that firms and industries can decline and die.

Rather than taking a laissez-faire approach, Professor Foster urges government to act to secure productivity gains by creating the environment that allows entrepreneurial behaviour in firms to flourish.

The Australian Business Foundation presents Professor John Foster's thought leadership in this Occasional Paper and invites debate and action to advance its ideas.

**Narelle Kennedy**  
**Chief Executive**  
**Australian Business Foundation**

## ABOUT THE AUTHOR

### PROFESSOR JOHN FOSTER

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John Foster has been a Professor of Economics at the University of Queensland since 1991 and was Head of School from 1999 to 2008. He is a Fellow of the Academy of Social Sciences in Australia, Fellow of the Queensland Academy of Arts and Science, President Elect of the International Joseph A. Schumpeter Society, Vice-President of the Queensland Branch of the Economic Society of Australia and a Life Member of Clare Hall College, Cambridge. He was an appointed Member of the Australian Research Council College of Experts from 2005 to 2007 and an appointed Member to the Panel Reviewing the National Innovation System in 2008.

His current research interests are in the following fields: innovation strategy and policy; the innovation and diffusion of distributed energy generation systems (CSIRO Flagship Program funding); assessing the impact of new carbon trading schemes on the generation, transmission and distribution of electricity and on the wider economy (ARC Linkage Grant Funding); applying self-organisation theory to statistical/econometric modelling in the presence of structural transitions (ARC Discovery Grant funding); integrating the energy sector into an evolutionary macroeconomic model of economic growth.

## ABOUT THE AUSTRALIAN BUSINESS FOUNDATION

The Australian Business Foundation is a unique business-sponsored collaborative research body at the centre of a vibrant community involving Australian and international scholars, policymakers, opinion-leaders and business executives.

Established as a non-profit company limited by guarantee with an independent Board of Directors, staffing and finances, the Australian Business Foundation has for over a decade nurtured evidence-based research into business innovation and sustainability, emerging models of business competitiveness and opportunities arising from a knowledge economy.

The Australian Business Foundation is funded and backed by the business sector and has pioneered a distinctive model of collaborative and influential research. The Foundation undertakes its research in partnership with expert scholars and practitioners both nationally and internationally. It strives for depth, rigor and practicality in its research, drawing out original content and insights and interpreting this for impact and use.

The Foundation bridges the gap between research and those in business and in public policy. It contributes new evidence and fresh insights to contemporary economic and social debates.

# Introduction

In a number of countries, fiscal stimulus packages were constructed to combat the global downswing. The rationale for such action centred upon a 'Keynesian' view of stabilisation policy. The Australian Federal Government was at the forefront, introducing pre-recessionary fiscal stimulus measures. By the time of the Federal Budget in May 2009, the stimulation strategy had been extended firmly into supply-side measures to boost spending on various forms of infrastructure. And, in what may have been a world first, spending commitments were made with the post-recessionary recovery phase in mind, even before a recession was identified in a statistical sense.

Science, higher education and R&D all received strong boosts. In all, spending budgeted for innovation, broadly defined, was increased by 25%, again very unusual in recessionary conditions. So it is clear that the Government has not just been following the prescriptions of John Maynard Keynes in a simplistic way. It has also acknowledged the importance of boosting the national innovation system to try to ensure that strong productivity growth, and associated competitiveness, will be present in the next cyclical upswing.

This focus upon the stimulation of innovation is an acknowledgement of a 'Schumpeterian' perspective on economic growth, promoted in the *Venturous Australia Report* (2008). However, there have been a number of indications in the media that adopting this perspective in a recession has not been widely understood.

The purpose of this paper is to explain what Schumpeterian evolutionary economics is, why it is highly relevant to understanding the position that the global economy is currently in and what its implications are for economic policy.

In particular, this paper points to the central role that innovation policy must play in fostering entrepreneurial activity in large and small firms if Australia is to position itself for the next wave of productivity growth. A surge in productivity is vital for Australia to contend with the long term challenges of an aging population, a declining tax base and the implications for the income and services likely to be available for the Australian community.

# The Schumpeterian Perspective

The global financial crisis and the associated downturn in economic activity and trade came as something of a surprise to most economists. There has been a lot of subsequent talk about 'irrationality' led by prominent critics of standard economic analysis, such as Robert Shiller. This is, of course, uncomfortable for many economists because standard economics is founded on a strong presumption that people are rational in the sense of being capable of optimizing, subject to various constraints, such as the income they have to spend and the prices that prevail, when making decisions. This is referred to by economists as 'constrained optimisation theory.' Also, in relation to expectations concerning the future, they are also presumed to be rational in the sense that all available information is used and any systematic deviations of expectations from actual outcomes lead to corrections – we 'learn from our errors'. Systematic errors still can occur but these are seen as being short-lived. So economic variables, although they fluctuate in a stochastic manner in the short-run, are viewed as tending to equilibrium states in the long run. These states are deemed to be consistent with the predictions of constrained optimization theory.

## Rationality – not the full story

These concepts of rationality lie at the core of modern macroeconomics, which we can divide into two loosely defined camps: New Classical/ Real Business Cycle Macroeconomics and New Keynesian/Endogenous Growth Macroeconomics. The former places great faith in the private sector's capacity to maintain growth on a fluctuating path and is generally opposed to government intervention of the Keynesian kind. However, little convincing empirical support is provided for the theories promulgated by this School. The latter School views markets as subject to failures that have to be fixed by government intervention. Although constrained optimization theory is kept at the core of analysis, this School's literature lacks the analytical clarity and consistency of the former. This is because allowances are made for 'market imperfections' that exist in the real world in which decisions are made. The result has been a large collection of differing, and often incompatible, theoretical results with limited empirical support.

In the face of serious recession, governments have mostly ignored both of these Schools. Instead, what have been applied are old-fashioned stabilisation policy principles, pretty much in line with those suggested by Keynes over seventy years ago for a low inflation economy sliding into recession. This is a startling observation because it suggests that much of modern macroeconomics is deemed to be irrelevant.

So policymakers have turned the clock back to a time when economics was quite different in nature and emphasis. In this regard, it is striking that the most important insights of the three truly great economists of the 1940s, Keynes, Friedrich Hayek and Joseph Schumpeter have been largely eliminated in modern macroeconomics. A key message of all three was that we cannot fully understand how an economy works by basing our models upon constrained optimisation theory or, in modern macroeconomic terminology, 'neoclassical micro-foundations.' Both Keynes and Schumpeter, in their different ways, argued strongly that macro-econometric models, based upon the supposition of universal constrained optimising behaviour, could never predict the timing or the extent of big fluctuations in an economy. The repeated failure of such models to predict such fluctuations accurately, of course, has confirmed that this assessment was correct. Hayek, although he firmly rejected Keynesian stabilisation policy, was even more strongly opposed to the use of macroeconomic analysis, based upon neoclassical micro-foundations.

None of these three great economists argued that people were 'irrational'. What were being challenged are unrealistic assumptions made about the extent of knowledge, the capacity to compute optimal strategies and the ability to enact them. Typically, important decisions are made in states of uncertainty where it is unclear what the possible set of outcomes is and what the likely probabilities these outcomes are. In such conditions, it is an impossible task to find an optimal strategy and, by the time one is enacted, conditions will have changed. Rational people know this and they also know that doing nothing is often the worst choice, so they have to rely upon intuitive beliefs about what might happen in the future, often by looking over their shoulders to see what others think. What Keynes referred to as "animal spirits" – the "will to action in preference to inaction" – can be a quite rational response in an uncertain world.

The problem is, of course, that intuitive beliefs, affected by emotions and the opinion of others, are often likely to be wrong so that rational decisions based upon them turn out to yield poor outcomes. And, if these incorrect beliefs have spread in a contagious manner, a lot of people can make big mistakes at the same time, despite being quite rational in their behaviour in the light of the beliefs that they have adopted. When we are dealing with an evolving complex economy, with an expanding, but incomplete, network of contractual and trading connections, it is hard to spot whether a belief is sensible or not. And, indeed, in such conditions, there is no 'objective' benchmark because the adoption of beliefs itself results in actions that determine actual outcomes. In turn, perceived outcomes affect beliefs. So what we have in states of radical uncertainty are two-way feedbacks between beliefs and actual outcomes that result in trajectories that are non-equilibrium in nature.

## Uncertainty and the importance of mistakes

Once we accept that beliefs are important drivers of behaviour and that these can result in cumulatively reinforcing mistakes, the existence of a range of beliefs becomes very important. In evolutionary economics, this is viewed as crucial in understanding economic growth and its fluctuations. Evolutionary economists argue that the process of competitive selection eliminates those who make mistakes. Those who happen to apply beliefs that yield the best product and/or process then come to dominate. So errors and mistakes are not a bad thing, they are a necessary part of the process that generates economic growth. But, of course, since such growth is yielded by a self-reinforcing non-equilibrium process, it is to be expected that there will be times when beliefs concur strongly and start to run ahead of the real capabilities of an evolving system. Then we are likely to observe structural transitions, whereby 'booms' turn into recessionary downswings accompanied by significant wealth devaluations. Thus, even though people act quite rationally, given their various beliefs, economic evolution, and associated economic growth, will, necessarily, be a fluctuating process.

## Entrepreneurial behaviour, experimenting and evolution

Almost a century ago, Schumpeter developed the first version of this fluctuating theory of economic growth. He went much further than Keynes: animal spirits do not just generate fluctuations in an economy, they are associated with the entrepreneurial behaviour that lies at the very foundation of the process of economic evolution. Such behaviour involves business decisions that, necessarily, must be made in states of radical uncertainty. It leads to the creation of new combinations of technologies, organisational rules and human skills to generate novel products. Such behaviour is driven by aspirations to make profits and accumulate wealth. But, operating in uncertainty, there must exist a set of beliefs concerning the future, both with regard to future market conditions and the internal effectiveness of the organisational/technological combinations that have been devised. Those engaged in entrepreneurial activity, whether in a small firm or in a functional role in a large firm, are famously over-optimistic in forming beliefs and only a minority of projects succeed. But, as discussed above, this does not mean that behaviour is 'irrational.' Given a set of beliefs, rationality is usually applied, both in designing and planning projects, and in managing the complex new processes that are introduced. But behaving rationally does not guarantee success. Indeed, there is evidence in organisational sociology that trying to be too rational in the conventional sense discussed can be a handicap in new enterprises (see Carroll and Hannan (2000)).

In uncertainty, it is not possible to know until after the event which entrepreneurial scheme turned out to be the most efficient and/or produced the most desirable product. This will depend upon what market conditions and internal configurations actually emerge. Some will succeed as much by accident as design. Although the majority of entrepreneurial initiatives fail, many succeed because there is a vast

diversity of market niches that become available as a complex economic system evolves. But we do not necessarily see the extent of failure in the competitive selection process because we mostly observe the projects that survive. This gives us the illusion that what we see are the optimal outcomes of rational decision-making.

But the reality is that these survivors are the outcome of a vast experiment in which the failures play a crucial role. Without entrepreneurial individuals and groups risking failure, there would be no economic evolution.

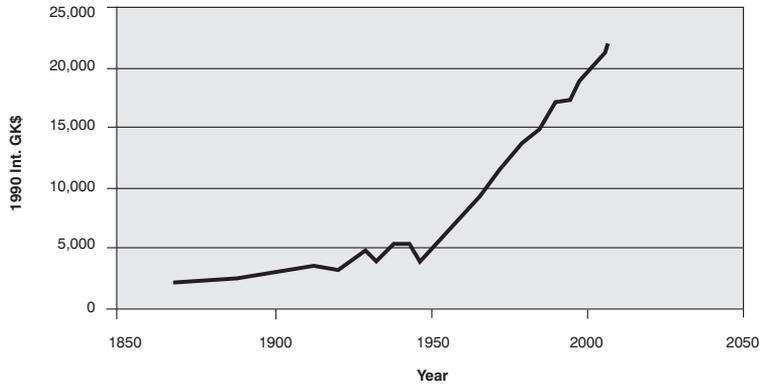
So Schumpeter told us that entrepreneurship was the key to economic progress and that constrained optimising behaviour was of secondary importance. But he also told us that, because of this, cultural and institutional rules must be very important since they affect the beliefs that are adopted and determine the extent to which they can be acted upon in economically useful ways. He saw two problems with economic evolution in this regard. First, the winners in entrepreneurial races secure considerable power and, thus, may be able to bend the rules in their favour allowing them to mutate from efficient organisations to inefficient rent seekers that block new entrepreneurial initiatives employing new productive systems and offering better products. Second, the very process of economic evolution renders institutional rules obsolete, again providing openings for opportunists to extract rents.

Schumpeter argued that the process of 'creative destruction,' whereby the obsolete is replaced by the innovative, involves power politics that can have decisive impacts. By the time he wrote *Capitalism, Socialism and Democracy* in 1942, he noted that many large firms had come to understand the threat that creative destruction posed and established internal units engaging in entrepreneurship and innovation to enable them to adapt and avoid being destroyed. He, therefore, felt that small entrepreneurial enterprises would play a lesser role in the process of innovation. The evidence briefly discussed in Section 6 confirms that, in the half century that followed, this shift occurred. However, many large firms still failed or were taken over because of an inability to internalise enough entrepreneurship to stay viable.

Schumpeter, who died in 1950, did not fully anticipate the extent to which countries would become social democracies, overseeing mixed economies, in the post-war era. Somewhat starkly, he saw growing government intervention as the advance of socialism with negative implications for entrepreneurship. But the advance of the social democratic mixed economy did not eliminate the process of creative destruction but, instead, it provided stability and a reduced level of uncertainty. The climate for entrepreneurship improved in economies where government was a much more active participant. In such economies, entrepreneurship was much less individualistic and less obvious than in Schumpeter's depiction. It was dominated by entrepreneurial groups both within and between large firms (see, again, Carroll and Hannan (2000)). As can be seen from Chart 1, the rate at which productivity growth occurred in Europe, where social democracies were most strongly in evidence, from

1947-2006 was significantly higher and more stable than previously. The mixed economy proved to be more favourable for innovative and entrepreneurial behaviour than many had anticipated.

**CHART 1: EUROPEAN REAL GDP PER CAPITA**



Source: Maddison (2009)

# The Global Crisis and the Long Wave

Schumpeter, in his monumental two volume *Business Cycles*, saw economies as, necessarily, going through long irregular waves, with upswings stimulated by the entrepreneurial exploitation of radical innovations and downswings occurring when obsolete power structures, arising from a long period of strong economic growth, collapsed liberating resources to be used in a new upswing. But he recognised that this was no mechanical process, it was very much a political process. How well countries did in long upswings depended critically upon culture, politics, law and the actions of governments.

Carlota Perez in *Technological Revolutions and Financial Capital: the Dynamics of Bubbles and Golden Ages* (2002) argues that growth in the World economy takes place in successive surges of about half a century, each driven by a technological revolution. There are predictable stages to these surges: technological revolution – financial bubble – collapse – golden age of prosperity – political unrest.

She argues that it is to be expected that financial capital will become decoupled from production capital in the process of turbulence and adjustment that occurs over the years and decades it takes for a radical innovation to diffuse into the economic system. There is an “inflexion point” in this slow, sigmoid-shaped process of diffusion (see Chart 2). This is observed to occur following a financial bubble precipitated by excessive early optimism concerning the prospects of new technological advances. This inflexion point is associated with sudden and significant asset revaluations which are followed by a prolonged period of wealth creation, as incremental innovations are widely adopted and spread out globally. At the end of this long diffusion process conditions re-emerge that are favourable to a new wave of innovation.

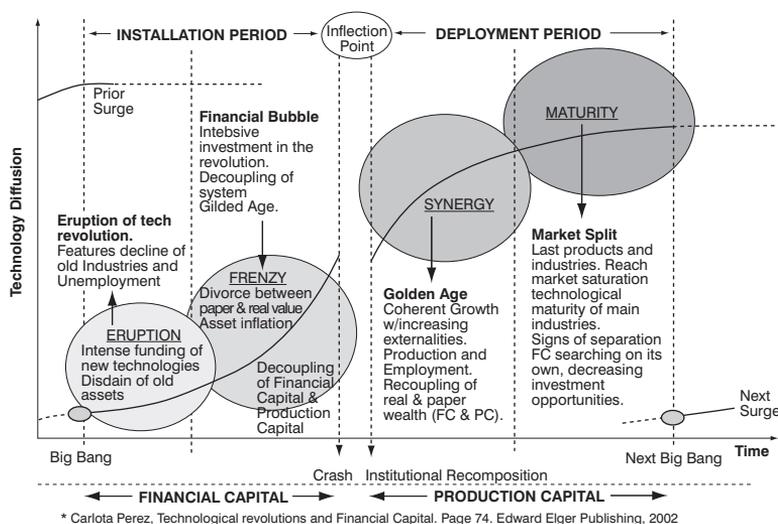
According to Perez, each technological revolution has led to the massive replacement of one set of related technologies by another and, each time, there has been an early frenzy of new investments in new industries by a new generation of entrepreneurs. The latter succeed in attracting large quantities of speculative capital from a financial sector receiving very modest returns from existing investments in firms and industries that have reached maturity. This exuberance in the world of technology and finance and its pace of change is not matched by the development of new regulatory frameworks or appropriate institutions needed to ensure financial and economic

sustainability. Turbulence inevitably follows. But once the ‘reality check’ of a crash has occurred, the benefits of the new technological regime can be realised in terms of jobs and productive investment in a ‘golden age’ of prosperity.

Perez charts the successive technological surges historically, eg. in the first industrial revolution in the 18<sup>th</sup> century of mechanisation and building of roads, bridges and canals; the age of steel, electricity and heavy engineering in the last half of the nineteenth century; oil and automobiles in the 20<sup>th</sup> century; and, post 1971, the age of information and telecommunications.

Following Perez (2002), we can view the 2008-9 global crisis in Schumpeterian terms as an ‘inflexion phase’ of a long upswing that began with the commercial adoption of personal computers in the 1980s. This had been made possible by breakthroughs in the miniaturisation of electronic components. In the 1990s, widely decentralised personal computing allowed electronic communication to be exploited commercially and, by the 2000s, the internet had become a commercial vehicle. This decade also witnessed the mass adoption of the mobile phone, again due to advances in the miniaturisation of electronic components, and by 2008, these had started to become fully integrated with new ‘Web 2.0’ internet communications.

**CHART 2: LONG WAVES OR K-WAVES**



The spread of innovations associated with the miniaturisation of electronics opened up vast possibilities for communications, commerce, marketing and the introduction of new kinds of assets and liabilities. Such diffusion processes, stemming from radical innovations have been observed to follow sigmoid shaped curves that are manifest at the macroeconomic level when observed over long periods (see, again, Chart 2).

However, the segments of such curves are not smooth, there are always minor crises along them. Global recessionary conditions around 1991 followed a burst of over-optimism concerning the commercial potential of personal computers. Prior to that recession, it was still the case that relatively few firms were able to fully exploit installed personal computers, for example, using email. The stock market shock of 1987 was, itself, partly about a malfunctioning interaction of trading computers and indicative of lack of an understanding of how interacting computer-controlled systems worked in a financial trading context. Productivity growth slowed while aggregate demand increased. The resultant excess demand led to sharp increases in interest rates, precipitating the 1991 recession. In this recession there was a shake-out and consolidation in the computer industry, resulting in the emergence of very strong commercial PC hardware and software platforms at real prices that fell rapidly as sales increased. This fuelled strong rises in productivity growth through the 1990s.

The next hiccup occurred in the late-1990s. At that time, there was gross over-optimism concerning the commercial possibilities of the internet. But, again, commercial up-take was slow and the result was the dot-com crash in 2000. The stock market fell in 2001 after 9/11 and there followed a mild recession in the US as confidence weakened. But, once again, a strong platform emerged, this time in internet capacity and in the range of internet services on offer for commercial application. But productivity growth did not rise: the stimulus this time mainly fuelled financial innovation and growth in the quantity and value of assets and liabilities.

In both of these sub-phases of the long upswing, we see entrepreneurship in action with phases of excessive optimism, shakeouts followed by the emergence of competitively selected strong platforms. The last phase of the wave, prior to the current inflexion crisis, was driven by the fast communications possibilities enabled by the internet, facilitating a vast expansion in the provision of new financial assets and liabilities. This introduced a great deal of new complexity into the global financial system and it became hard to know what appropriate asset values were. Again, there was over-optimism, leading to lending that should not have occurred. But this was more fundamental than in the previous mini-crises since it involved core institutions in the system, the banks, and it spelt the end of the quasi-exponential phase of the long wave and the onset of a long upswing inflexion crisis.

The optimism that was manifest in this long upswing was not confined to the private sector. Throughout it there had been little attempt to control money and credit magnitudes. By the late 1980s, interest rate targeting had become the preferred instrument of monetary policy which meant, by default, that the reserves held by the banking system and, thus, the credit they created was not controlled. In a world where inflation was falling to low levels, this was not of concern, particularly when most central banks began to tie interest rate policy to a low inflation target from the early 1990s on. There developed a misplaced view that, if inflation was brought down to low levels, there would not be a problem with the real economy.

The vast expansion of credit had its biggest impact in pushing up property prices across the world. But, because of low inflation, the real value of outstanding mortgage debt was not whittled away by inflation as it had been in the 1970s. Interest rate targeting saw to that. Lenders in housing markets had seen GDP grow exponentially since the 1980s and, in a low inflation world, they were assured by central banks that this growth was likely to continue. Provided that this was true, then there should be enough demand growth in the property market to sustain continuing capital gains. But, of course, this was the old problem of optimism getting ahead of reality and, when reality bit in the US, confidence collapsed and, along with it, the stock market, closely followed by the global economy.

The important thing to note about this episode is that it was not simply due to 'irrationality.' It was a systemic problem whereby entrepreneurial individuals and organisations adopted beliefs that had official backing and took corresponding action within a particular set of regulations. The beliefs turned out to be incorrect and some regulations gradually became obsolete in the vast new financial system that was evolving.

As noted, post-inflexion long wave phases involve creative destruction and this is affected by the extent of political conflict that arises. After the inflexion crisis that began in 1929, a number of economies drifted into an unusually protracted phase of negative growth because of a strong culture of protecting existing industries. This prevented the process of creative destruction from operating strongly to eliminate the obsolete and inefficient to make way for the innovative. At the international level, lack of agreement concerning free trade in 1932 ensured that protectionism would strengthen and it wasn't until after a devastating war that an international agreement on trade was finally struck that permitted a new long wave upswing to get underway.

The last inflexion crisis, after the commodity price boom of the early 1970s, was not followed by such serious political problems. This was mainly due to the presence of two great post-war innovations in governance: the bi-partisan adoption of stabilisation policy to counter recessions, which persisted despite the emergence of 'monetarism' in the face of high inflation, and the strong global commitment to maintaining international trade. Although, in some respects, the recent inflexion crisis looks more serious than the last one, stabilisation policy was easier to implement because of the fact that there was no inflation problem and, once again, few signs of a rise in protectionism.

However, the speed at which the global economy moves on to the post-inflexion growth trajectory will depend critically upon the emergence of an effective set of new regulations for the global, electronically-connected banking system. This is particularly important in the United States and, although the Obama Administration has now commenced this process of change, it will not be easily achieved, given the vested interests that are involved. The failure of countries to agree on a new global regulatory platform would be reminiscent of the free trade negotiation failure of 1932, since it would result in protracted economic problems, this time because of limitations on the growth of international borrowing and lending.

# The Six Elements Necessary for a Long Wave Recovery

The extent of entrepreneurship requires a delicate balance between rules that provide system security and rules that keep a system open enough to allow new connective structures to be created. This is the domain of modern complex systems science, applied in the socio-economic domain (see Foster (2005)). But it is not a new way of thinking: it has been embedded in the school of evolutionary economics for many decades (see Dopfer (2005) and Hanusch and Pyka (2007) for comprehensive assessments). Drawing upon this tradition, we can identify the connections between entrepreneurship and fluctuating economic growth.

It has been argued that long wave upswings are stimulated by entrepreneurship that involves both investments in radical innovations and in the spread of incremental innovations. Radical innovations, of course, involve the most uncertainty.

*No less than six coinciding elements can be identified as determining the strength of a long upswing: organisational innovation, technological innovation, institutional innovation, available finance, available skills and available physical energy.*

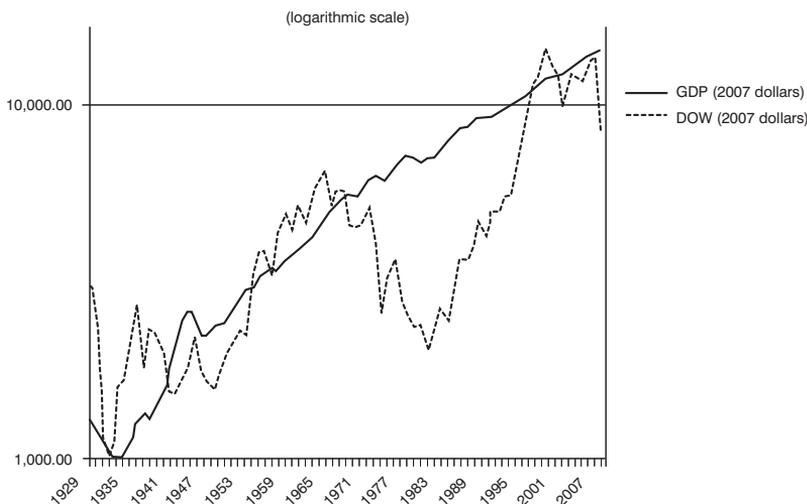
If we go back to the start of the current long wave in the mid-1980s, oil and coal, the primary energy sources, were at very low real prices and in good supply; nominal interest rates were quite high, but real interest rates were low and finance was not hard to obtain; real wages, which had soared in the 1970s, had fallen to modest levels relative to productivity; and with an unemployment rate still relatively high, there was plenty of skilled labour on offer. With regard to organisational innovation, there emerged new business models for a PC age with associated electronic innovations and, on the institutional side, it was an era of market liberalisation and rapidly expanding trade. In other words, there was a full hand of the necessary cards for a long wave upswing to commence through 'radical entrepreneurship.' It is also possible to identify the presence of the six elements in the late 1940s at the commencement of the last long wave.

When the inflexion crisis broke out in 2008, there was a serious skill shortage, energy prices were at historical highs and real interest rates had peaked in many countries. Organisational and technological innovations had moved from the radical to the

incremental stage and there were many enterprises due for elimination but were being sustained by a strong demand boom. Institutional innovation had largely stopped and many regulations had become obsolete.

We are now entering a phase where there will be significant ‘creative destruction’ in the core business of our economies. It will be a phase where only the most efficient and adaptive firms will survive using new ICT and regulatory platforms. These surviving firms will provide the stability necessary for entrepreneurial activity to produce the next generation of radical innovations that will drive the next long upswing. But one of the difficulties in the late phases of long waves is that it becomes harder to raise capital on stock markets when tight profit margins make it more difficult to fund entrepreneurial projects from retained earnings.

**CHART 3: US REAL GDP IN \$BILLIONS AND THE REAL DOW JONES INDEX**



In Chart 3, the Dow Jones index is compared with US GDP, both in real terms, on a logarithmic scale since 1929. Real stock prices declined in real terms in the end phase of the last long wave, from the mid-1970s to the mid-1980s, making it a difficult time to raise capital. Indeed, this decline, although less sharp, was more marked than in the post-1929 phase in proportional terms. Chart 3 also shows that real GDP is not a good indicator for identifying long waves, as Schumpeter stressed in *Business Cycles*.

The six elements that are required to spark a long upswing are not guaranteed to be strong in any particular economy. If they are not then that country will perform poorly in a global recovery. The rank order of countries in terms of GDP per capita has changed after each inflexion crisis for this reason. After the 1929 inflexion crisis, a world war occurred before the required six element configuration emerged in a significant number of countries, including Germany and Japan.

# Entrepreneurship and Creative Destruction

A great deal has been written about innovation but it cannot happen without entrepreneurial firms seeking ways in which innovation can be turned into profit. However, this element tends to be understated in discussions of innovation policy. We cannot just assume that these firms will automatically try to seek profits by promoting innovation. Crime, corruption and rent-seeking are also entrepreneurial options that are popular in some countries. So, all innovation policies must have explicit incentives and strategies to encourage entrepreneurship of the required type in both small and large firms.

As has been pointed out, when we are dealing with entrepreneurial firms that develop new products and/or processes in states of radical uncertainty, we cannot talk of market failure since a market, by definition, does not yet exist. But there may be a 'system failure' where the institutional structure that exists either obstructs or cannot facilitate innovation. What entrepreneurial firms need are institutional arrangements that facilitate their efforts and, thus, reduce the uncertainty that they face. This is often more important than the provision of traditional financial incentives. For example, the rules that govern the award of R&D subsidies may result in a lot of support going to relatively low risk projects. Measures to promote and facilitate entrepreneurship are not always very expensive but they can be challenging for a government to provide because they require an understanding of emergent industries that a public sector administrator may not have. Also, outcomes are very difficult to measure since there is no 'business as usual' benchmark that can be applied.

A good innovation policy helps along the process of 'creative destruction' by assisting entrepreneurial firms to win market niches while removing the rent-seeking power of mature players. Thus, a good innovation policy has to go hand-in-hand with an effective competition policy and it has to be tied to hard political decisions concerning the withdrawal of subsidies to obsolete firms and industries. Of course, when a relatively large industry is involved, there can be considerable pain when it collapses. What this means is that an effective innovation policy has to be just as much about the careful management of the 'destruction' part of creative destruction.

When an industry is observed to be in decline, its retreat has to be managed over a realistic length of time. It may well take a decade. Some countries, such as Sweden, have been able to dismantle declining industries successfully, ensuring that skills were not wasted and, where skills were obsolete, targeted re-training was provided. Because it takes a long time to manage the orderly exit of an obsolete industry, a bi-partisan policy approach has to be adopted. This approach has been very evident in some social democracies, such as Sweden and the Netherlands, but less so in, for example, the United States and Australia.

The reality of the innovation process is that entrepreneurial firms need the 'space' created by the departure of obsolete industries. They need the skills, the financial resources and the removal of restraining regulations designed to protect old industries. Furthermore, those involved in new business ventures need to have access to networks to share ideas when there is mutual interest in solving common problems. Evidence, for example, concerning development of the Australian wine industry supports the view that good networking and information sharing is highly beneficial in the early stages of an emergent industry.

A battle between obsolete, but powerful firms and innovative entrepreneurial ones is mainly fought in the late phase of a long upswing. The fact that inflexion crises and associated recessions lead to the demise of many obsolete firms can often strengthen the power of those which remain. And, of course, recessions are indiscriminate in removing the weak – they also destroy vulnerable entrepreneurial firms in emerging industries. So it is particularly important in this phase that entrepreneurship is strongly supported at all levels. Not only do small innovative enterprises struggle, large firms also tend to economise on expenditures on entrepreneurship and innovation.

It has generally been true that, in history, entrepreneurs have swum against the current and have often been resented for doing so. Yet, progress has been due to the efforts of both the winners and the losers in entrepreneurial races. So an effective innovation policy has to champion entrepreneurial initiatives in every context. This has to be the first priority in an innovation policy. Education and training are, correctly, identified as key facilitators in providing knowledge and skills for the innovation process. But, like art, entrepreneurship is about the creation of novel combinations to yield unique structures and products. Thus, the strategies that are adopted have to go beyond the use of standard economic incentives.

# Policy Priorities

In modern advanced economies, up to 80% of GDP is in services. Thus, it is necessary for innovation policy to shift in emphasis away from traditional R&D towards the encouragement of entrepreneurship that utilises organisational innovations to deliver new services, or existing ones more efficiently, using ICTs. Evidence for Australia by Hughes et al (2007) shows that, in recent years, high productivity growth has been in the service sector and Smith and O'Brien (2008) have shown that considerable amounts of innovation in service delivery lie outside standard measures of innovation. A process of ICT-driven economic evolution has been occurring over the past two decades, but this is still not properly understood or fully embraced in innovation policymaking. The important policy priorities in such an economy seem to be the following:

- Explicit government strategies to promote entrepreneurship, the sharing of knowledge by potential and actual entrepreneurs and the creation of networking arrangements to permit entrepreneurial firms to access new knowledge generated by research organisations and other bodies.
- A public commitment to education and training to produce a skilled and creative workforce.
- Public support for the development and dissemination of organisational innovations so essential to bringing new skills and new technologies together.
- A capacity to enact regulatory changes in a timely manner to allow entrepreneurship to be profitable in new fields.
- Public support for science and R&D to provide research findings that can be commercialised as well as trained scientists and engineers who are capable of innovating and importing technological innovations from other countries.
- Public guarantees that allow finance to flow to entrepreneurial activity from risk-averse financial institutions.
- Governmental tolerance for failure and an associated capacity to distinguish genuine entrepreneurial failure from rent seeking activity.

- A bi-partisan strategy to assist obsolete industries to downsize and release their human and non-human resources for effective use in emergent industries.

So to what extent does current innovation policy address these priorities? In the *Venturous Australia Report* and in the *Sainsbury and Innovation Nation Reports* in the UK and the *Rising Above the Gathering Storm Report* in the US, there is clear recognition that an ICT-driven evolutionary process has been occurring and that this has been raising service sector productivity. In each, all of the policy priorities above are discussed with varying emphasis, but the critical question concerns the extent to which they have become embedded in actual policies. To seek an answer to this question, it is useful to examine the recent Australian White Paper, *Powering Ideas*.

This White Paper is an important milestone in the development of innovation policy in Australia. It has provided significant increases in support for science, higher education, tertiary training and R&D. These are all necessary to prepare for the coming new long upswing and the Federal Government has to be commended for this. However, measures to encourage entrepreneurship, entrepreneurial interaction with innovators and knowledge sharing, particularly in the context of an ICT-based service sector, are rather limited and ill-defined.

Enterprise Connect, introduced in 2008, is clearly useful, but with only \$59 million committed in 2009-10, it is not a major expenditure item. The proposed establishment of Commercialisation Australia with \$196 million in funding over four years seems to be directed at facilitating entrepreneurship, but its scope seems restricted to a limited range of formal commercialisation programs. Also, it doesn't compensate for the loss of the successful Commercial Ready scheme, surprisingly abolished in the 2008 Budget. There seems to be uncertainty as to what governments can best do in this area and the danger is that, as is the case with Enterprise Connect, a 'busy bureaucracy' will be set up that focuses on facilitating routine business improvements and processes, rather than promoting innovative activity that transforms the capabilities of firms to create new sources of competitive advantage and value.

Another initiative that is likely to be useful to entrepreneurial firms is the \$83 million Innovation Investment Follow-on Fund and there is the on-going initiative to set up Industry Innovation Councils.

Laudable as these initiatives are, a coherent strategy in relation to entrepreneurship seems to be lacking. This is in contrast to the clearer spending plans in the areas of R&D, science and higher education. One of the reasons for this contrast is to be found in the language used in *Powering Ideas* in Chapter 5 - Business Innovation. Public spending in what is a complex policy area gets the standard investment appraisal treatment. It is argued that: "[t]o justify the community's investment, all programs and incentives must achieve explicit goals that can be measured against objective benchmarks..." (p. 45).

And all the measures are justified in terms of there being a “market failure” which has been deemed by this author to be analytically inappropriate in the entrepreneurial context. For example, market failure is identified in the area of venture capital. But, when a financial institution cannot gauge the worth of an innovative project, it is not because of a market failure due to an “asymmetry of information”, it is because of the existence of uncertainty. Venture capital companies develop portfolios of uncertain projects knowing that many will fail. The identified lack of venture capital investment in Australia is more likely to be due to a lack of credible entrepreneurial projects in the “pre-seed, seed and start-up stages.” This is not a “market failure.”

Paradoxically, this is made clear on the same page: “The passage from experimental development to commercialisation is so treacherous that high-tech start-ups call it the valley of death” (p.47). So, how can the government “maximize” (p.50) returns on public investment in the “valley of death?” Undeterred by making this statement, it is then stated categorically that: “The Australian Government will continue to use these instruments to increase the supply of venture capital when these markets fail.” (p. 49).

This apparent confusion is evident in other statements such as the suggestion that the Small Business and General Business Tax break is about innovation when it is really about the purchase of plant and equipment. But even more worrying is the fact that there is confusion about subsidising protection versus promoting innovation. The ‘Green Car’ subsidy (a huge \$6.2 billion) is identified as a key innovation initiative. Of course, it is laudable for the Government to be attempting to promote innovation that can result in carbon reduction, but there are many cutting-edge firms outside Australia developing both hybrids and electric vehicles. A good innovation strategy would have been to invite such companies to submit proposals to build their vehicles in Australia, rather than to just subsidise local vehicle manufacturers who may well never become competitive in producing ‘green cars’. This suggests that a political imperative to continue protection of the car industry weighed heavily in the formulation of this policy.

Similar comments can be made concerning the \$1/2 billion subsidy for ‘clean coal’ research, one of the long-shots in the quest for carbon emission free energy. It is clearly important that the Government provides strong support for R&D to reduce carbon emissions in power generation, but such funding should be available to entrepreneurial ventures in all of the new alternative technologies. To restrict a significant amount of the funding to one technology creates the impression that the strong lobbying power of an entrenched industry has influenced policy. From a Schumpeterian perspective, the protection of a soon to be obsolete industry amounts to an anti-innovation policy. Instead, what is required is a long term, bi-partisan plan to assist coal-fired generators to wind down their capacity in an orderly manner, not measures to protect them and extend the time horizon of their operations.

Successful large firms know that they have to cross-subsidize their innovation efforts and that normal cost-benefit principles don’t apply. The same is true of a government

promoting innovation in an economy. The promotion of entrepreneurship in both large and small firms has a lot to do with the dissemination and management of knowledge. Cantner, Joel and Schmidt (2009) have shown empirically, using data from the German Innovation Survey of 2003, that high quality and well-structured knowledge management in innovating firms result in significantly higher success. This suggests that government measures to facilitate better knowledge management and transmission in small and medium sized entrepreneurial firms in an economy are also likely to lead to more successful innovations.

Stam, et al. (2007), using data from the Global Entrepreneurship Monitor, find a strong relationship between the extent of entrepreneurship and GDP growth, and a particularly strong one with entrepreneurship if there are relatively high expectations of success based on high quality knowledge. But the payoff in encouraging entrepreneurship is not only in raising innovation. Several studies have shown that all entrepreneurship indicators are positively related to employment growth (See Audretsch et al (2006) for a review of the evidence).

Evidence provided in the *Powering Ideas* White Paper makes it clear that Australia has performed poorly relative to other OECD countries in relation to entrepreneurship and associated firm based R&D in recent times. However, the policy initiatives adopted in the White Paper will do little to change the culture and institutional arrangements that are responsible for this low ranking. Even in the minerals and energy sectors, which have played a key role in the export sector in recent years, productivity growth has been very low because of a lack of innovation and associated entrepreneurial behaviour in large corporations. Unless this changes, we shall enter the next long wave upswing with a lot of infrastructure, new scientific findings and more graduates but a distinct lack of entrepreneurial potential.

# Conclusion

The economy and the organisations within it are complex adaptive systems. In understanding the growth and fluctuation of economies and the appropriate government policies to facilitate progress, we have to take such a perspective. It is an 'evolutionary economic' perspective that can be traced at least as far back as the writings of Joseph Schumpeter. It tells us that the entrepreneurial individuals and groups that create more complex economic organisations that produce novel goods and services are pivotal in generating economic growth but, necessarily, they must operate in a state of uncertainty where conventional economics does not always apply.

In such a world, the beliefs that are acted upon and the institutional arrangements that are faced both facilitate and constrain economic evolution. Entrepreneurship is a manifestation of a basic human drive that we can rely upon to generate economic evolution provided that conditions are right. It is up to government to ensure this in a proactive manner. Although there is an important role for quantitative incentives in the form of, for example, R&D tax breaks, the essence of innovation policy has to lie in creating the best possible conditions for entrepreneurship to flourish. At the present time, Australian innovation policy, although significant progress has been made, is still lacking in this regard.

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