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DRIVERS OF QUEENSLAND’S ECONOMIC GROWTH

by

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DRIVERS OF ECONOMIC GROWTH

Introduction and Context

I am pleased that the Conference Brochure preamble to today’s Business Symposium is headed “Please note that this program is subject to change”.

Firstly, of course, I must record my gratitude to Mark Rider and the Conference organisers for so gracefully, and at such a late stage, agreeing to change the time of this paper.

Secondly, I am afraid that I will disappoint those of you who may have expected to hear about “modelling the Queensland economy”. Perhaps to the relief of some, and I trust not to the substantial disappointment of any, I intend to talk about a less relentlessly technically topic. I propose, instead, to talk about economic growth and productivity in relation to the economy of the State of Queensland.

Before I begin, however, I must make several caveats. Firstly, this paper should not be taken to necessarily represent the views of the Queensland Government or the Queensland Treasury. Nor should it be taken to represent necessarily the several or collective views of the team members who are working on this collaborative research project. I will discuss this project itself in more detail later, but it should please be understood that the project is by no means finalised, and any views expressed in this paper represent work and thoughts in progress.

Economic growth has been a major issue of interest to the State and to policy and decision-makers here for a very long time, and productivity – the very essence of economics – is a key part of economic growth. These issues have a long history of interest in the State, and show no sign of flagging.

The issue of what drives economic growth is central to the development of good economic policy and to our understanding where the economy is likely to head over the next decade. Queensland economic growth has, on average, been faster than that in the rest of Australia over the past decade.

Figure 1: Relative Economic Growth: GSP (Index 1989-90 = 100)
The questions often posed to Treasury, by a wide range of stakeholders, ministers and business people, investors and ratings agencies, are:

• what have been the historical drivers of economic growth which have produced this persistent average differential;

• what is the status of these drivers now and likely to be in the future, and what environmental factors affect these drivers; and

• what can and should we do to promote, and attach the State to, the right drivers of growth.

These are not easy questions to answer, especially when that additional dimension of the future is introduced. Can and will any historical positive differential continue into the future? As usual, though, it seems that one cannot look into the future without a firm understanding of history and the current situation and context.

Let me place the questions in context. As I see it, the critical environmental factors are:

• federation

• time;

• global economy;

• technological change;

• resource endowment and

• fiscal reform.

**Federation**

Firstly, let us consider the place of the State of Queensland within the federated nation state of Australia.

The federation of Australia is a customs union, a labour union, a monetary union, effectively a fiscal union, especially now with the GST, a social and cultural union and a political union. Nevertheless, the States still have independent constitutional legitimacy, and importantly, a considerable residual stock of powers and responsibilities, and even economic and social policy instruments.

In particular, States are still largely responsible for the primary areas of domestic social and economic services and infrastructure – education, health and transport, to name three. This means that the States retain critical influence over not only key social matters, but over some of the key long run instruments of economic policy.
Time

As economists, we often seem to fall into the trap of being fixated by the short run – short-term economic conditions, short term instruments of policy and short term fixes. By the short term, I mean a focus on:

- today (which may be the focus of many in financial markets);
- this week or month or quarter (which may be the focus of many in business, and those in thrall of the media); and even
- this current year or two (which may be the focus of Treasuries and monetary authorities).

What I think is more important, and perhaps many of us here will agree, is the longer term, by which I mean five to ten years, or even longer. State operations, whether providing physical or human capital, or whether providing steady delivery of current services, are inherently long term.

Global economy

Globalisation is a popular current word, although it is not always used as a term of approbation. Nevertheless, many analysts, business people and policy makers, and even many farmers, politicians and trade unionists, believe that not only is globalisation inevitable, but that it is also desirable and has delivered many benefits to the Australian economy. To an economist, this is hardly surprising – our education trains us to understand comparative advantage and the benefits of specialisation, integration and trade.

There is a powerful view in Queensland that the real strength of the Queensland economy in the post-war period was enabled by the development of the export coal industry and the realisation that integrating our economy with Japan was the way to create rising employment and incomes.

Technological change

This is also powerful stuff – this is the age of computers, the internet and amazing telecommunications, of biotechnology and Human Genome research, of space exploration and so on...

The challenge, as others, such as Robert Gordon earlier in this Conference have explained, is for service industries, in particular, to share in the productivity advances that primary and secondary industries have experienced, facilitated through technological advances.

Certainly we still seem to be awaiting much of a difference in productivity in services, especially in say office white-collar jobs, dare I say it, including general government. I personally doubt much can be achieved until major
cultural changes occur, including general acceptance of the need for such simple reforms as time records, real (and not make believe) project management and real (and not make believe) performance and MI systems.

We have much to learn from some private sector legal, accounting and engineering firms. In my view, from my observations, we have much to learn from workers at the grass-roots level about service industry operations, and much to learn to make IT systems really productively useful in service industries.

Resource endowment

This is rather like globalisation – you just can’t get away from comparative advantage and specialisation. In Queensland’s case, it is doubtful that we can ever stop specialising in agriculture, mining, manufacturing based on these industries and tourism exports.

As productivity has worked away in the first three – agriculture, mining and manufacturing – employment has fallen and incomes have generally risen (such as in the coal mining areas of central Queensland, which rival the north shore of Sydney in taxable incomes).

Of course, many rural/agricultural incomes have been steadily reducing, despite what seems to be excellent resource endowment. The case of Queensland dairy farmers being outcompeted by Victorians comes to mind. The changes that have been experienced by agriculture over the post-war period have been very hard for many producers and manufacturers, and globalisation without the trade protection afforded by blocs such as the European Union, the USA and Japan has meant bitter experience for many in agriculture. Resource endowment has not helped here. But it cannot be evaded – economic growth is fundamentally determined by resources and by the capacity to use those resources efficiently and sustainably.

I note that State Governments do own, on behalf of their principals – the voters, the community – many of those resources, including minerals, land and other property rights.

Fiscal reform

The move to accrual accounting in government in Australian and many countries and provinces overseas, and the accompanying reforms in budgeting systems, have major implications for economic growth policies. The change in thinking about capital, away from a costless resource, is one factor. The move to longer planning and budgeting horizons is another. The increased focus on outputs, outcomes and performance, and the accompanying demands for new information, is yet another.
State Governments, including Queensland’s, have committed to this reform – the most significant reform in public sector accounting, one of my accounting colleagues tells me, since the time of the Stuart Kings!

The thesis

You will therefore have begun to appreciate that, since economic growth is inherently a long run proposition, and that since States have considerable and significant powers and responsibilities for long term service delivery, and more importantly capital delivery, it is my thesis that:

• Firstly, that States still have some capacity to influence events – perhaps not sustainably or by very much in the short run cycle – but certainly in the domain of the long run trend, which is the true temporal domain of economic growth policies, if only through their capital formation policies;

• Secondly, that economic growth is inherently a long run phenomenon. We can only truly discern it from all of the other noise of economic data in the long run, and the fundamental factors which determine growth patterns operate chiefly in the long run, since capital takes time to accumulate, and productivity-inducing change takes time to take effect;

• Thirdly, States are legitimately concerned with policy questions (and answers) relating to the formation of both physical and human capital, and therefore economic growth and productivity; and

• Fourthly, that State stakeholders – by whom I mean those with an interest in the risks that relate to the States – are also legitimately concerned in the State’s growth and policies.

On reviewing this thesis, one might be concerned about the strength or proof of some of it. In particular, one might be concerned about whether the propositions about the long run focus of economic growth and its relationship with capital is rigorous, and even whether if true, it is properly understood. As an economist with the usual expensive disciplinary education, my prejudices (aka training) tell me that this is true, but the same education urges me to check and test the facts and the theory.

The project

In particular, the fundamental factors which determine growth patterns – our “drivers of growth” – need rigorous understanding. What drives economic growth in Queensland has therefore become the topic for the first economic research partnership with Queensland universities to be undertaken under the auspices of my Office.

The Office of Economic and Statistical Research is a portfolio office of Queensland Treasury. It comprises fourteen specialist teams of economists,
statisticians and other information professionals. While the economists in my Office may be best known for their modelling capabilities and projects (material which I passed on speaking about today, but about which I am normally only too keen to speak – but you can find out about their models on our web sites) their tasks include monitoring, researching and forecasting the structure and performance of the Queensland economy. The portfolio Office also includes the Office of the Queensland Government Statistician.

As far as we are aware, the Office is unique in the Australian States. The existence and status of the Office, and the resources allocated to it, are proof of the Queensland Government’s long run interest in rigorous and transparent economic research and intelligence. Interestingly, the aim of the Under Treasurer, through the operations of the Office, to allow for whole-of-Government benefits in research from the substantial human capital in the Office, is itself congruent with this project.

I should recognise at this point the human capital of the team members – I am more than pleased to name them – they include John Foster, Phil Bodman and Mirko Draca from the University of Queensland; Tom Nguyen and Christine Smith from Griffith University; and Christine Williams, Michael Cunningham, Cecil Chan and Jimmy Louca from Queensland Treasury’s Office of Economic and Statistical Research. This is a formidable intellectual arsenal, and much is expected from it. I would like to make clear that the work presented here is the joint product of this group. (I would also like to thank Christine, Michael and Jimmy from my Office for their kind assistance in helping me to produce this paper.)

The work presented here is the product of the regular monthly meetings that take place and the individual research that occurs between these meetings. It is also preliminary in nature, with the first research papers from this project expected in October this year.

Tom Nguyen and Christine Smith of course delivered a paper earlier in the Conference on the issue of variations of productivity amongst the States in Australia, which has been produced as part of the project. Their paper indicates some very interesting evidence of remarkable similarities in labour productivity performance, after allowing for the influence of mining activity.

Today I would like to draw a broad-brush picture of how I see the project and some of the other work and lines of thought and approach which have appeared to date from the team. Fortunately for me, only the team members will be aware of the difference between their current performance and my representation of it. I apologise in advance if I miss the mark.

Who needs to know the answers to these questions about drivers of growth? Obviously the Government does, and indeed any stakeholder in economic growth in the State, including external interests, such as, dare I suggest it, financial markets. Even if the interest group comprised only those interested in the rating of Queensland Government debt, it would be sufficient (and necessary) for this project to proceed.
What is the key issue? To me, the key issue is productivity. Put simply, an economy can grow by adding inputs or by improving the rate at which inputs are transformed into outputs. A key question is therefore, to what extent has Queensland's historically high rate of economic growth been attributable to these two components.

**Myths**

Before addressing that question, it is salutary to consider the issue of myths. They exist about all sort of things, including economies and societies. There are a number of enduring, but hardly endearing, myths about Queensland. It would be useful to clear the fog caused by these myths.

Myth 1: Queensland’s economic growth is caused only by high population growth i.e. gross state product has increased by more than in the rest of Australia by a correspondingly higher population growth rate.

Fact 1: Queensland’s gsp per capita growth rate is higher than that of the rest of Australia. Over the ten years to 1997-98, Queensland’s average annual rate of growth of gross state product per capita was 2.4% compared with 1.8% for the rest of Australia.

Myth 2: Queensland’s relatively high population growth has been caused largely by hordes of elderly people retiring to the Sunshine State.

**Figure 2: Comparative Age Distribution of Net Interstate Migration - % (1996)**

![Figure 2: Comparative Age Distribution of Net Interstate Migration - % (1996)](image-url)
Fact 2: While the high population growth differential is largely caused by high net interstate migration, most migrants have been families, with labour force members looking for jobs. Any disproportionate influx of retirees started in the 1970s – and largely ended in that decade – as Queensland introduced another fiscal innovation – the abolition of death duties.

![Figure 3: Aged Dependency Ratios (%)](image)

What is not surprising is that the disproportionate flow of retirees ceased when other States matched the policy – what is surprising is that so many “expert” commentators still haven’t caught on after twenty years. Yes, we might have more retirees still coming here compared with the numbers moving to other States, but it is a modest movement which reflects reasonable economic incentives, for example, lower house prices – wealth goes further – and higher temperatures – living (or at least heating) costs are lower.

Of course, these two factors also influence the decisions of migrants in the working age cohorts. And then there are other factors again, such as higher employment growth rates, lower taxes, and more, which in a more jingoistic mood and with more time I would be keen to extol.

But perhaps I should move on quickly.

Myth 3: there is also a myth that Queensland is nothing more than a quarry and a farm. This is a serious matter, as there is indeed a global financial market perception that this accurately describes the Australian economy. It is serious because it influences the perception of country/economy risk, that we are subject to the currents of commodity price fluctuations and that our economic/industrial structure is unbalanced and deficient.
Fact 3: while agricultural and mining products dominate Queensland (and Australia’s) merchandise exports, and while this does not unreasonably influence the perception of country risk, it is nevertheless true that Queensland’s industrial structure is much like any other developed economy, and, in terms of the proportion of industrial production in services, identical to the rest of Australia, with around 80 per cent of economic activity stemming from the service sector.

Indeed, looking at total exports of goods and services, a quarter of these are made up of exports of services, including tourism and education exports. The only industry which may be under-represented in Queensland, compared with the rest of Australia, is manufacturing.

**Industrial structure**

This raises the question of how the components of the Queensland economy impact on growth – whether they act to encourage or to discourage faster than average economic growth? The usual component structures are by expenditure or by industry.

Looking, over the period from 1990-91 to 1998-99, at the contribution to growth in real gross state product from components of expenditure, it is clear that there are differences in where Queensland’s above average growth comes from. Household consumption contributes 1.1 percentage points more to growth in Queensland than it does in the rest of Australia. Indeed, the differential in household consumption accounts almost entirely for the difference in the average growth rates over this period.
However, encouraging faster growth in household consumption does not seem to be a convincingly sustainable policy choice to encourage growth, with investment in capital stock and productive capacity being a more conventional option. Investment in machinery and equipment does however contribute 0.2 percentage points more to growth in Queensland (0.5 percentage point) than in the rest of Australia (0.3 percentage point).

What about the contribution to output growth from different industries?
Interestingly, despite accounting for only 12 per cent of output in Queensland, compared with 15 per cent in the rest of Australia, manufacturing contributed a similar amount to overall growth in both regions, 0.6 percentage points. That is, manufacturing grew relatively faster in Queensland (5.5 per cent) than in the rest of Australia (3.8 per cent). However, it is clear from employment data that, at least to some extent, this was due to greater employment growth.

Manufacturing contributed to growth in employment in Queensland over the period, while detracting from employment growth in the rest of Australia.

While manufacturing is a industry which can readily benefit from productivity gains, the other industries which have contributed more to growth in Queensland than elsewhere are predominantly service industries, such as retail and wholesale trade, health and community services and education.

These are all industries which are not only labour intensive, but industries in which productivity gains are usually recognised as being hard to measure (given the usual methods of valuing outputs by the cost of inputs) and to achieve. The service industries which can benefit more easily from productivity gains, such as property and business services, are under-represented in Queensland, both in terms of the level of output and employment, and in terms of their contribution to growth.
So there are differences in the industrial structure, but it is still unclear how these differences have led to a faster rate of economic growth in Queensland.

In order to investigate more formally the extent to which the structure of the Queensland economy is predisposed to faster than average growth, dynamic shift share analysis has been employed. (This work is attributable largely to Christine Smith of Griffith University). Shift share is a type of decomposition analysis, whereby changes in regional output (in this case, gross state product) are explained in terms of their composite factors:

- national growth rate effect;
- proportionality shift; and
- differential shift.

The national growth effect is calculated as the growth in state output which would occur if output in each industry in state were to grow at the overall national rate of output change.

The proportionality shift is calculated by summing, over all industries, the product of output in a given industry in state and the differential between the national growth rate in that industry’s output and the overall growth rate of national output. This shift can be interpreted as the component of growth that is attributable to state’s industrial structure.

Finally, the differential shift is calculated by summing, over all industries, the product of output in a given industry in state by the differential between the growth rate of that industry’s output in state and the national growth rate of that industry’s output. This shift can be interpreted as the component of growth that is attributable to state’s industries experiencing faster/slower growth rates compared with their national counterparts.

Following Boudeville (1996), economies can be classified as one of eight types depending on the sign and relative size of these growth components.

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For example, a Boudeville Type 2 economy is one where the industrial structure should lead to above average growth, but where the growth actually exceeded these expectations.

A Boudeville Type 6 economy is one where the industrial structure should lead to below average growth, but the economy markedly exceeded these expectations, with an above average growth outcome.

Examining real GSP at factor cost over the period 1985-86 to 1998-99, Queensland emerges as a Type 6 economy. That is, Queensland’s industrial structure should lead to below average GSP growth, but the State markedly exceeded this prediction to produce an above average growth outcome for GSP growth.

This contrasts with Western Australia, with which Queensland is often compared. In real output terms, WA is classified as a Type 2 economy.

In current price terms, while Queensland remains a Type 6 economy, WA is reclassified also as Type 6. That is, Queensland appears to have had less of a boost to GSP growth from commodity price changes moving in its favour than WA over this time frame.

This result, that Queensland has not benefited from commodity price movements over the period is also confirmed in another productivity analysis undertaken as part of the project, which found that the terms of trade has actually acted as a dampener on economic growth in Queensland. Perhaps the assessment of the financial markets may perhaps not be too mythical or mystical after all.

This analysis has suggested that the Queensland economy has grown faster despite its industry structure, rather than because of it.

So we are no closer to understanding why the Queensland economy has grown faster.

Is it primarily because of the faster population growth? Can we analyse economic growth by abstracting from the growth of labour inputs? Growth accounting allows us to establish how much growth can be attributable to the accumulation of labour and capital, the factors of production, and how much is left unexplained, that is, Solow’s residual, or total factor productivity.

**Productivity growth**

Productivity, whether labour or total factor productivity is central to improving real income levels and living standards, and the question of what drives economic growth may be addressed by looking at the factors which influence productivity growth.
So how does Queensland’s productivity growth compare with that of the rest of Australia over the past decade or so?

There are a number of ways to estimate productivity growth.

Recently, in a paper by Fox et al (2000), an index number approach was used to decompose growth in New Zealand’s gross domestic product into various factors, including productivity growth. New Zealand’s total factor productivity was estimated to be around 1 per cent per annum over the period from 1985 to 1996.

Using a similar methodology, we can compare the components of growth in Queensland’s gross state product with those for Australia. The time period used is limited by data availability to 1986-87 to 1998-99.

Figure 8: Annual Total Factor Productivity Growth, 1988-99

For Queensland, the compound rate of growth for real GSP over the period was 4.9 per cent, which compares with 3.5 per cent for Australia.

Our preliminary results indicate that the component of growth estimated to be due to total factor productivity in Queensland is 1.7 percentage points, or around 35 per cent of total real growth. For Australia, the equivalent estimates are 1.3 percentage points, 37 per cent, or around the same productivity growth estimated by OECD (1998).

It is more informative to compare Queensland with the rest of Australia, with Queensland making up around a sixth of national output.
The comparable compound rate of growth for the rest of Australia over the period is 3.1 per cent, with 1.1 percentage point (also about 35 per cent of total growth) being due to total factor productivity.

(It should be noted that these estimates are based on preliminary estimates of capital stock for Queensland, which may be subject to revision. While we are also concerned about the extent to which the similarities in estimates may be due to unavoidable measurement issues, there is currently no better information available.)
Also contributing to the faster growth rate in economic output is the much faster growth in labour input (measured in hours) in Queensland over the period (contributing 1.5 percentage points to growth, compared with 0.8 percentage points in the rest of Australia). This is largely a consequence of Queensland’s faster population growth.

Interestingly, terms of trade have had a negative impact on growth in Queensland, detracting around 0.5 percentage points on average each year.

For the rest of Australia, there has been a marginal positive impact from terms of trade (0.2 percentage point). This reflects the very different composition of overseas merchandise exports from Queensland than for the rest of Australia, with a greater dependence on commodities (approximately 70 per cent in Queensland, compared with 30 per cent in the rest of Australia).

So, the project team’s preliminary view is that Queensland’s productivity growth appears to have been faster, on average, in Queensland than in the rest of Australia over this period.

In other words, Queensland’s growth is not due entirely to faster growth of its labour force, or to its greater accumulation of physical capital, both private and public, over the past ten years. But the question as to why remains elusive.

I would now like to turn to some of the other areas of investigation by the project team, including some of the recent developments in economics which have emerged to deal with the apparent inadequacy of conventional economics to deal with the issues of economic and productivity growth.

**Policies to foster growth**

I hesitate to say that government policies can drive all growth, as economic growth is dominated by private sector decisions and actions. However, apart from the direct contribution of the public sector, government policies can influence and enable economic growth.

Is there any broad consensus across time and politics about this? My cautious answer is yes. One simple reason is the proof of the pudding – in the eating. Our growth performance has been broadly satisfactory, and this could not have been achieved without a broad and lasting political consensus about the need for sound policies conducive to economic growth.

Many decisions by Government have an impact on the economic development of the State. The best outcomes will be achieved only if these decisions are made in a consistent, coherent framework based on a clear understanding of what fosters economic development. In the absence of such a framework, clear priorities can not be set and ad hoc decisions will often conflict with each other.
It is therefore comforting to note the broad consistency of State Government policy frameworks across time.

For example, the Goss Labor Government, in its 1992 economic development statement, *Queensland – Leading State*, recognised that the role of a State Government was fairly limited. The statement said that

“The contribution of State governments will be greatest when they clearly understand the limits on their economic influence and make best use of that influence in those areas where the State’s economic strategy can have a demonstrable impact.”

It went on to define the Government’s approach as one of “…market enhancement, where government creates an environment in which markets can operate efficiently, with minimal government interference with prices and commercial decision-making, and concentrates its own efforts on areas, such as general education, in which markets prove inadequate.”

The Borbidge-Sheldon Coalition Government also adopted a market enhancement approach in its 1997 *State Economic Development Strategy*.


There is also a broad international consensus among economists and economic policy advisers of the factors that are conducive to economic development (the capacity of an economy to respond positively to changing circumstances) and economic growth (increased output). These factors are based on theoretical understanding, supported by empirical evidence. They are, in brief:

- well-balanced macroeconomic settings, which are limited at the State Government level, although fiscal responsibility and transparency policies – such as the Queensland Government’s Charter of Social and Fiscal Responsibility – are possible and important;

- market-aware microeconomic policies which encourage, and remove impediments to, wealth-generating entrepreneurial, innovative behaviour by firms and individuals;

- adoption of policies which foster a supportive institutional framework; and

- a focus by government on ensuring efficient and effective provision of appropriate, client-focussed services, including education and training, and infrastructure services.

It is also widely recognised, as any business people present may confirm, that certainty and consistency in the application of policy is a critical factor in
attracting investment. Arbitrary and inconstant policy increases risk and raises the required rate of return on investment.

A recent OECD report in 1999 on what drives productivity growth also highlighted the importance of competition. It said that the degree of competition in a particular country or sector may be among the most important elements of the economic framework, since lack of competition reduces the pressure on firms to incorporate better technology, tighten their organisation and improve productivity. Many studies find strong links between openness of trade, growth of exports and productivity, and find that the diffusion of technology may also be promoted by openness to international competition.

The substantial efforts of State Governments, including Queensland, in maintaining trade offices and promoting international competition is proof of the State’s recognition of this key point. Indeed, another of the Beattie Labour Government key Whole-of-Government Priorities is “an internationally competitive economy”.

**New growth theory**

Much of this is fairly well understood, but the work of the new growth theorists, since Paul Romer’s seminal paper in 1986, has provided many new perspectives and insights and has stimulated a great deal of useful work in economics. These theorists have made a major contribution to economics, mainly through opening up the “black box” of exogenous technological progress which was an unexplained residual in Solow’s 1957 model of economic growth. This will be a particular area of concentration of attention by the project team.

Rather than replacing mainstream economics, the new growth theorists have led to a number of concepts and approaches being revisited. There has been a great deal of both theoretical and empirical work to better understand the contribution of technological progress to economic growth, and therefore to increase our capacity to foster it.

The new growth theory has been used by some – mainly non-economists – to support more interventionist government policies, particularly in development of human capital, through areas such as R&D and education. However, the level of understanding derived from the theory and empirical evidence is as yet generally insufficient to support specific policies.

For example, Paul Romer’s latest paper casts some light on why we might be cautious about the merits of intervention. He considers whether the US Government should subsidise supply or demand in the market for scientists and engineers – those who carry out R&D.

Romer sees an error in US policy, which subsidised private sector demand for scientists and engineers, while failing to ensure that the educational system could supply the graduates needed to match this government-stimulated
demand. This failure arose at least partly because increased subsidies for PhD training from 1980 to 1995 were biased towards those students favouring an academic career, rather than a business research career.

The main points of Romer’s paper are that:

1. Increased spending on R&D may not lead to an increase in the quantity of inputs to R&D. Romer presents data showing that much of increased US R&D spending has been appropriated in higher wages for scientists and engineers, and says the focus should be on inputs.

2. These higher wages have provided a signal to immigrants, but not to students making college choices - higher expected earnings for scientists and engineers do not affect student choice because the relevant tertiary institutions (unlike some in other disciplines) do not provide data on expected earnings.

3. From 1980 to 1995, increased support for university-based research, which is complementary to PhD training, led to increased subsidies for PhD training. This, in turn, led to a fall in the proportion of natural science and engineering PhD students on traineeships (which were industry-related) and an increase in those funded as research assistants (who were oriented to an academic career).

4. Consequently the growth in of natural science and engineering PhDs has led to a great number of PhDs stuck in dead-end university jobs. Romer said, “Much of this flow [of natural science and engineering PhDs in the late 1980s and 1990s] has been directed at two of the alternatives of leaving graduate school - university employment and post-doctoral and other “holding” positions. The challenge in this area is not to increase the total number of Ph.D. recipients, but to increase the fraction of them that can put their skills to work in private sector research and development. “

I might be just bold enough to note at this point that, apart from, of course, private sector universities, the universities in Queensland appear to be technically “owned” by the State Government. But perhaps not bold enough to comment further than that, other than saying that, as a personal observation, and directly contradicted by the experience of this project, that there is possibly far too little interaction and partnership between the public sector and the universities in Queensland. Do universities make enough of an effective contribution to productivity and economic growth in the State? Compared with their considerable potential? I wonder. Nevertheless, there are some encouraging signs (apart from this project), including the significant personal interest shown by the Premier in the new frontier of biotechnology.

But back to Romer. He sees gains to the community coming from private sector R&D, and identifies institutional failures, which directed human resources to university careers rather than to business. The social returns
to government R&D funding directed at university training and at the private sector were lower in both cases than they could have been because the misguided application of university funding diverted students away from a private sector career.

This suggests that government intervention can fail to meet its aims, in this case from inadequate attention to the incentives and mechanisms for translating funding into the required objective – more of natural science and engineering PhDs engaged in commercially-oriented R&D.

An earlier paper of Romer’s (1996) is also relevant to consideration of the drivers of growth in Australia. Romer examined how the US economy developed, in the 19th century, a narrow advantage in the techniques of mass production for a small set of goods, and then turned this into a broad position of industrial supremacy by the middle of the 20th century.

Australia, Argentina and the US all had an abundance of resources, but their development has been very different. Romer found that, in the US, the abundant resources interacted with the scale made possible by a larger population and internal market, to create a technological lead in manufacturing. Such scale factors are still important in the so-called “Information Age”, as witnessed by the scale and success of Silicon Valley, and the literature on the economics of agglomeration or clustering.

Romer also argued that scale effects should be treated as they were by Adam Smith, that is, as a fundamental aspect of our economic world that follows from the non-rival character of ideas. He argues that neoclassical theory obscured reality by classifying technology as a public good. By contrast, new growth theorists divide the world into two fundamentally different types of productive inputs, which we can call “ideas” and “things.”

This line of research has led to Romer’s view, fairly compelling, and retrospectively obvious, that economic growth arises from the discovery of new recipes and the transformation of things from low to high value configurations. It is also fairly clear that you need clever people to do this.

**Human Capital**

The new growth theory work also emphasises the role of human capital in growth. However, the best measures of human capital, and which policies for capital deepening will be most effective in promoting economic growth, are not clear.

While some research has shown that years of educational attainment are an important explanatory factor (see, for example, Barro 2000), other studies have found that the average educational level of the manufacturing workforce explains little of the labour productivity gap between industrialised countries (see, for example, OECD 1999). Much research therefore remains to be done.
What does seem to be clear is that on-the-job and informal learning mechanisms, such as the informal transfers between engineers and scientists in clusters of high-technology activity, are important contributions to growth. The formal education and training systems are only part of the story.

How can such information about educational attainment be incorporated into a model of economic growth?

Intuitively, it is clear that the quality of the labour force, of our human capital, will impact on the rate of economic growth. This is also a clear message of the new growth theory – that the quality of the human capital stock is as potentially important as the quality of the physical capital stock. However, is it possible to quantify how improvements in the quality of human capital impact on the potential rate of economic growth in a country?

Work conducted by Fernandez and Mauro, using Spanish data, suggests a methodology to assess not only the past contribution to growth made by improved education of the population, but also the likely future impact of current educational reforms on the economic growth attributable to increased quality of labour inputs.

They suggest that full returns to investment in human capital occur with a long lag, and also suggest that there is a role for Government in encouraging that investment. Improvements in basic educational levels impact on the ability and rate of “learning by doing” and the impact of this less formal education on workers’ productivity. They incorporate the effect of both formal and informal learning in an index of human capital, which takes into account the changing demographic structure of the labour force, particularly concentrating on the age, gender and educational status of the past, current and future human capital stock.

For instance, Fernandez and Mauro have estimated and projected that the average annual growth in human capital in Spain is around 1.3 per cent for the period 1997 to 2002. This is projected to increase to 1.4 per cent for the period 2002 to 2007, reflecting the improvements in formal education attainment following the extension of compulsory schooling to age 16 in 1990.

Putting this into a growth accounting framework, Fernandez and Mauro estimate the contribution to economic growth in Spain resulting from human capital accumulation to be around a third of overall GDP growth, or about the same as physical capital accumulation over the past twenty years. All of this gain is the result of improvements in the quality of labour, with zero growth in the number of employed and a decline in the average hours worked per worker.

Part of our research task will be to create such an index of human capital for Queensland and the rest of Australia. Having done this, we will assess, not only the contribution to past growth from improvements in the quality of our
human capital stock, but also, with current policy settings, where this will lead to over the future in terms of human capital accumulation.

Conclusion

In conclusion, I would repeat that effective government policies for economic growth and development need to be based on a clear understanding of the drivers of growth, the policies which enhance them and the instruments which deliver them. This drivers of growth project is intended to help provide the Queensland Government and stakeholders with a clear and definitive understanding of these issues.

I trust others will be interested in this project. As progress will be posted on our web site, it will be possible to monitor this progress and interact with the team. I encourage you to do so, and sincerely hope you will.
References


