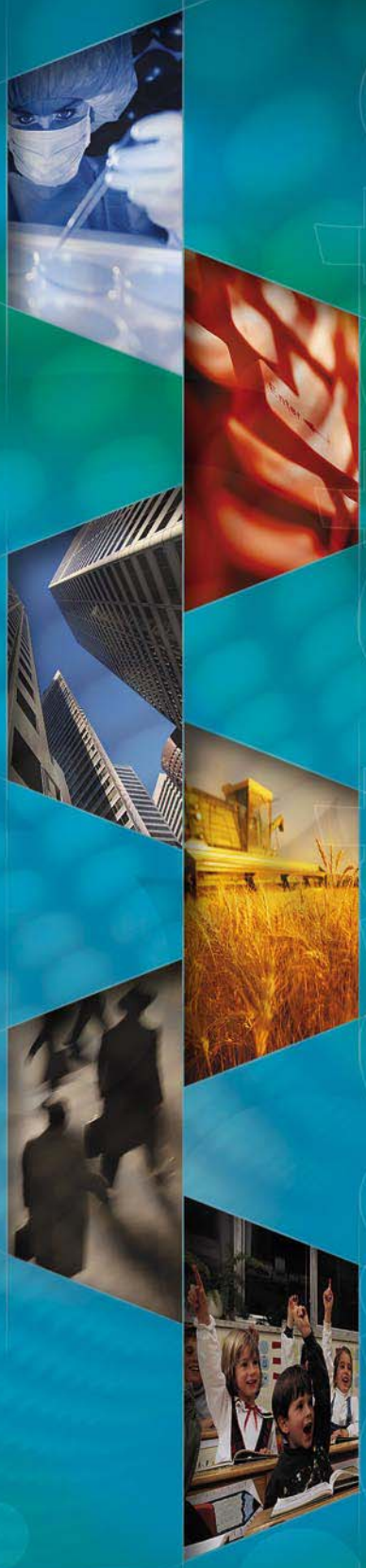

Drivers of Economic Growth in the Smart State

Productivity and Regional Economic Performance in Australia

Queensland Government
Treasury

August 2003

Contents

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1 Securing Queensland's future

The Goverment's key policy priorities

The Queensland Government is committed to ensuring the ongoing prosperity of the State as a modern, diversified economy and providing a better quality of life for all Queenslanders. This commitment is reflected in the State Government's *Charter of Social and Fiscal Responsibility*, which outlines the Government's five key policy priorities:

- more jobs for Queensland – skills and innovation – the Smart State;
- safer and more supportive communities;
- community engagement and a better quality of life;
- valuing the environment; and
- building Queensland's regions.

These priorities encompass economic, financial, social, regional and environmental policy issues, each of which is vital in improving the living standards of current and future generations of Queenslanders. One of the key factors underpinning the pursuit of each of these priorities is the continued enhancement of the State's economic performance.

Sustainable economic growth

Queensland's rate of economic growth has been identified as a significant performance indicator in relation to the Government's key priority of creating jobs and developing Queensland as the Smart State. Furthermore, sustainable economic growth is considered a vital ingredient in achieving each of the Government's key priorities.

Sustainable economic growth provides the foundation to support the further development of the State's industries and regions, which in turn leads to increased employment. The resulting growth in real household incomes increases the revenue base to enable the Government to provide enhanced services to Queenslanders. As a result, sustainable economic growth plays a vital role in delivering on the Government's key policy priorities. As incomes increase, individuals also tend to devote more time to other activities associated with a better quality of life.

Policy implications from the Drivers of Economic Growth project

Seeking to provide a better understanding of the nature of economic growth in relation to policy formulation, Queensland Treasury engaged in a collaborative partnership with The University of Queensland and Griffith University to examine economic growth in Queensland. The Drivers of Economic Growth project examined the factors that have impacted on the State's past economic performance and, more importantly, identified factors that will drive Queensland's economic growth in the future. The results have now been published in the volume *Productivity and Regional Economic Performance in Australia*. The main findings are outlined on pages 4 and 5.

This research was initiated to improve the Queensland Government's strategic policy formulation and the results have important implications for the State Government's policy approach in relation to a variety of issues, including:

- providing public services;
- providing capital infrastructure and fostering private sector investment;
- providing a regulatory framework that promotes efficient private sector activity;
- supporting innovation and industry development; and
- developing human capital, through education and training policies.

This paper reviews the major findings and policy implications contained in *Productivity and Regional Economic Performance in Australia* and discusses the extent to which they have been incorporated into the Queensland Government's current policy initiatives and broader economic strategy. It examines the economic rationale behind focussing on productivity growth and then discusses the implications for government policy in relation to maintaining sound economic fundamentals, promoting industry growth, fostering innovation and developing human capital.

The importance of productivity growth

2

Productivity growth as a source of sustainable economic growth

Economic growth is often used as a measure of both the economic performance of a region and the region's general well-being, with faster economic growth interpreted as indicating a healthy economy and an improvement in people's living standards.

The research papers contained within *Productivity and Regional Economic Performance in Australia* highlight that economic growth can be achieved by either increasing inputs, such as labour, capital and the use of natural resources, or by increasing the productivity of firms and workers, or by a combination of the two.

While increasing inputs is an important source of economic growth and can have desirable outcomes, such as providing more job opportunities, this type of economic growth has attracted criticism because it is considered unsustainable. In fact, the objective of achieving overall economic growth has often been criticised during the past 50 years as being narrow-sighted and not taking into account non-economic quality-of-life priorities (including the environment) that may otherwise be compromised by the pursuit of economic growth.

This dilemma arises in part as a consequence of the nature of the framework, based on the international system of national accounting, used to assess the rate of economic growth. Consequently, there may be some ambiguity about the benefits of an economic growth objective pursued to the exclusion of all other priorities.

Sustainable economic growth, on the other hand, can be seen as an appropriate long-term economic objective where productivity improvement, rather than increased inputs, is the critical driver of economic improvement.

Productivity growth generates a greater amount of income to be shared among citizens of a state and is thus the primary source of increases in real per capita incomes – the main economic indicator used to measure material living standards. In addition, policies that raise productivity in particular sectors, such as enhancing service delivery and improving the efficient use of natural resources, will raise individual well-being and improve environmental sustainability respectively.

Drivers of productivity growth

The key drivers of productivity growth across the labour force and industry are: capital deepening (providing workers and firms with access to greater amounts of investment and higher quality capital infrastructure); efficiency improvements (making better use of existing resources given current technology); and technological progress (driven by innovation and improvements in human capital).

Productivity growth will also become more important as a source of future economic growth because of several influences that are likely to constrain the growth of inputs as a source of economic growth in the future. These include:

- demographic trends (such as the ageing of the population) which are slowing labour force growth and affecting the composition of the workforce;
- financial trends (such as lower savings rates) which are impacting on the growth of physical capital; and
- environmental issues, which result in a greater emphasis on the sustainability of the State's natural resources.

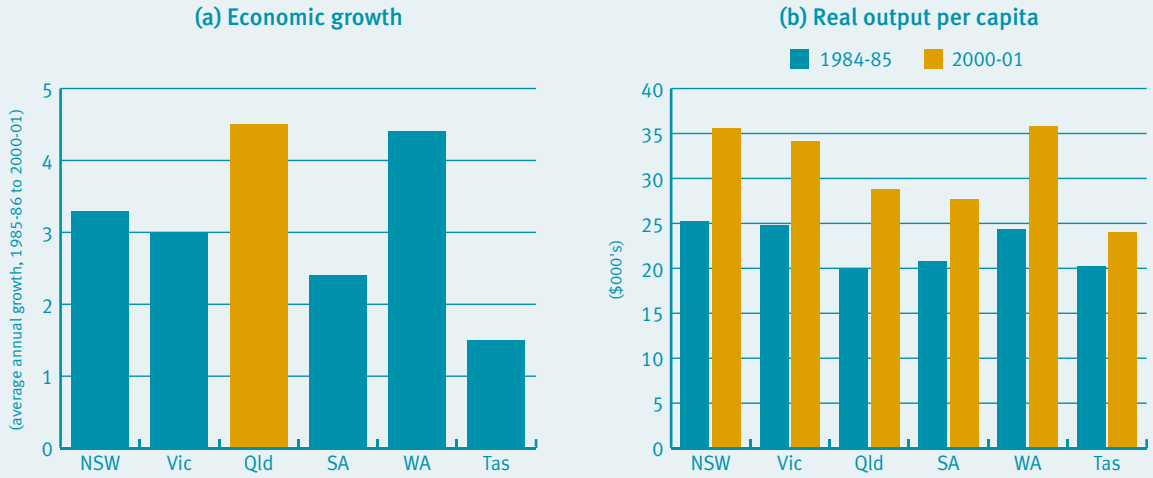
Treasury is undertaking further research work on these areas through the Intergenerational Research project, a research program that analyses the long-term sustainability of Government finances and individual living standards in light of changing demographic trends (see page 18).

Productivity and Regional Economic Performance in Australia

Queensland has experienced sustained economic growth over the past decade and a half, recording stronger rates of growth in output, real wages and employment than in the rest of Australia. This was a principal impetus to the Drivers of Economic Growth project, the results of which have been published in *Productivity and Regional Economic Performance in Australia*. The main aims of the project were to identify the factors that have resulted in higher economic growth in Queensland than in the rest of Australia and to highlight those factors that will play an important role in shaping future economic growth.

Several chapters examine how interstate differences in productivity determinants have influenced economic growth. Significant interstate differences exist in educational attainment, rates of research and development (R&D) expenditure, industrial structure and the impact and focus of microeconomic reforms. These differences have coincided with some states, such as New South Wales, Victoria and Western Australia, having significantly higher levels of income per capita than others. This highlights the need for state-based policies that promote productivity growth.

Regional economic performance, 1984-85 to 2000-01



Two productivity measures are analysed in the volume. The first, multi-factor productivity (MFP), measures output produced per joint unit of labour and capital, with growth in MFP driven by increased efficiency (making better use of resources, given existing technology) and technological progress (through innovation and human capital). The second, labour productivity, measures output per hour worked, and is driven by the rate of both capital deepening (where more capital is added to given labour resources) and MFP growth.

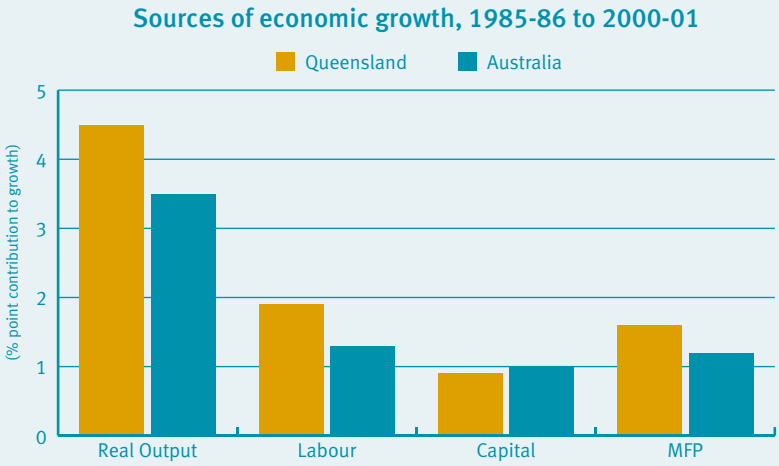
Queensland recorded the highest rate of output growth of any Australian state over the 15 years to 2000-01. Analysis in *Productivity and Regional Economic Performance in Australia* suggests this reflects the fact that Queensland had:

- more rapid growth in labour resources relative to other states, reflecting Queensland's higher rate of interstate migration and therefore faster population growth;
- higher productivity growth, with MFP growth explaining between 20% and 45% of economic growth and between 30% and 80% of growth in per capita incomes across the states.

As a result, Queensland narrowed the gap between its material standard of living and that in the rest of Australia, improving its relative position in terms of per capita output from sixth among the states in 1984-85 to fourth by 2000-01.

Several chapters address changes in per capita income differentials. The convergence hypothesis suggests that economies with lower per capita incomes should subsequently record faster productivity growth, thereby catching-up to higher income economies over time. This is because lower income

economies face a higher return on additional capital employed and thus should record faster rates of capital deepening, while lower income economies also can benefit by absorbing the latest technologies available in the highest income economies.



The results of the research suggest that more general convergence across Australian states has been relatively weak. Lower income states experienced faster growth in MFP but the states did not converge in terms of their capital-to-labour ratios. This led to similar rates of growth in labour productivity across the states and therefore a lack of convergence in per capita incomes. In particular, a mining boom in Western Australia resulted in that higher-income state recording a faster rate of capital deepening, while Queensland's strong population and employment growth resulted in a slower rate of capital deepening than in the higher income states – both contrary to what the traditional theory of convergence dynamics would predict.

A second important contribution of the volume relates to the sectoral explanations of interstate differences in economic performance over the past 15 years. This analysis separates national growth effects from industry mix and regional effects across the states. It finds that despite Queensland being less reliant than other states on those industries which recorded the fastest growth nationally, this was more than offset by a regional advantage, with most industries in Queensland recording higher growth rates than the same industries nationally.

A third major contribution is the finding that key drivers of technological progress, such as innovation and human capital, have largely driven interstate differences in productivity growth and per capita income levels. It is estimated that:

- business R&D growth explains up to 75% of the variation in multi-factor productivity growth across the states, and that Queensland and Western Australia, which showed the strongest rates of growth of business R&D expenditure, also showed the strongest growth in multi-factor productivity;
- differences in human capital can explain as much as 87% of the difference in per capita output between New South Wales and Queensland, with the most important determinant being differences in secondary level completions, rather than tertiary completions. Calculations based on 1996 Census data suggest that Queensland's Gross State Product (GSP) would have been boosted by $14.7 billion, or about $5,652 per capita, if it had a level of human capital similar to that of New South Wales. Initiatives to increase the year 12 completion rate in Queensland are critical for boosting real incomes in this State and closing the per capita income gap with New South Wales.

The combination of these findings highlight the need for policy responses that promote productivity growth if Queensland is to continue to grow at a faster rate than the rest of Australia and increase per capita income to levels similar to those recorded in the highest-income states.

Queensland's sound economic and fiscal environment

The papers presented in *Productivity and Regional Economic Performance in Australia* highlight the extent to which Queensland's future economic growth depends on increasing the productive capacity of the State's industries and workers. This underlines the need for state-based policies that directly promote productivity growth, such as the fostering of innovation and improving the human capital base.

The research also indicates the critical role of government policy in creating and maintaining economic conditions that are conducive to promoting this desired growth in innovation and human capital. In summary, the research stresses the need for a sound underlying economic environment in which economic choices can be made with a reasonable degree of certainty and confidence.

Importantly, this suggested approach to economic policy is consistent with the current policy stance of the Queensland Government and closely reflects the Government's economic strategy, as outlined in the 2003-04 State Budget (see page 8).

Productivity and Regional Economic Performance in Australia suggests that, in addition to policies aimed at directly promoting productivity growth, the Government also needs to continue to focus on fundamental areas of Government policy, including the maintenance of adequate and appropriate levels of infrastructure and capital investment. The provision of essential public sector capital services (e.g. transport infrastructure) needs to be maintained, while private sector infrastructure and general capital growth needs to be encouraged.

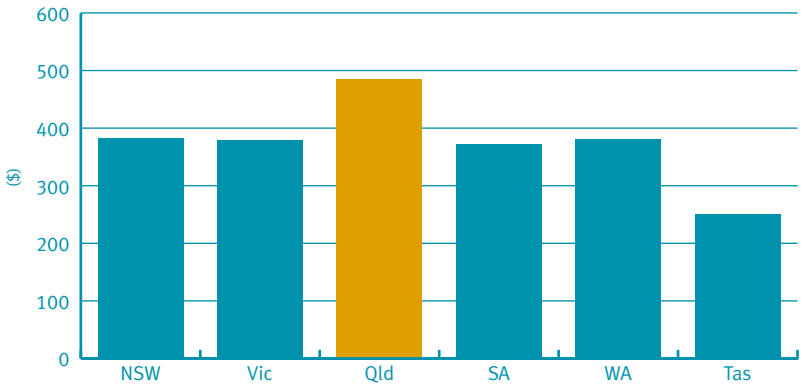
Ensuring an appropriate infrastructure base

In particular, the research shows that Queensland faces a unique challenge relating to the need to maintain higher rates of capital investment than other states, in order to maintain capital deepening in the face of rapid employment and population growth. This is primarily a challenge for the private sector, the major contributor to capital investment, with more than 80% of fixed capital formation in Queensland in 2002 being from the private sector. A further 8% was from public enterprises which also largely operate on commercial lines.

However, the Government also plays a crucial role in this process by promoting certainty and predictability in the business environment, as well as providing an efficient tax and regulatory framework that encourages capital investment by the State's firms and industries.

The State Government plays a vital role in providing the infrastructure needed for private sector economic development and Queensland has the highest General Government capital expenditure per capita of any state in Australia (see figure 1).

Figure 1: Estimated General Government capital expenditure per capita, 2002-03



Source: Queensland Treasury and various State Budgets

The State Infrastructure Plan outlines the Government's approach to the delivery of economic infrastructure including traditional 'hard' infrastructure (such as transport and communications), 'smart' infrastructure (including the support of scientific research and fostering innovation) and 'soft' infrastructure (such as the development of skills, business networks and research programs).

In addition, the Government is also developing more effective and innovative ways of encouraging increased private sector infrastructure investment, as well as fostering greater public/private sector collaboration in relation to major infrastructure projects.

This aim is primarily being achieved through the pursuit of the Public Private Partnership (PPP) initiative, which encourages the private sector and public sector to work collaboratively to deliver infrastructure projects. This approach to the provision of public infrastructure will be explored and adopted where it provides a more efficient and better value for money outcome for Queensland taxpayers.

Efficient government service delivery

The Government recognises the need to provide services to business and the community and is aware of the importance of enhancing the efficiency of its own operations. This is important in order to provide improved public services to the community, as well as limiting the State's call on fiscal resources through taxes and borrowing.

This reflects the State Government's fiscal principles, as set out in its *Charter of Social and Fiscal Responsibility*, with the recently completed Aligning Services and Priorities process specifically aimed at achieving more efficient service delivery by the State's public sector.

The Government has also developed Smart Service Queensland, the service delivery unit for whole-of-Government integrated service delivery. This initiative aims to improve the speed, availability and consistency of service delivery by providing a one-stop shop to all individuals or businesses wishing to conduct transactions with, or obtain information from, the State Government.

The papers contained within *Productivity and Regional Economic Performance in Australia* detail the clear linkages that exist between the maintenance of a stable, supportive economic environment and the effective implementation of more specific policy approaches aimed at improving productivity.

The research provides intellectual support to the Government's current policy approach, with policies aimed at maintaining a sound economic and fiscal environment complementing the Smart State strategy, which focuses on improving the productive capacity of the State's industries, strengthening the State's innovation system and increasing levels of investment in education and training.

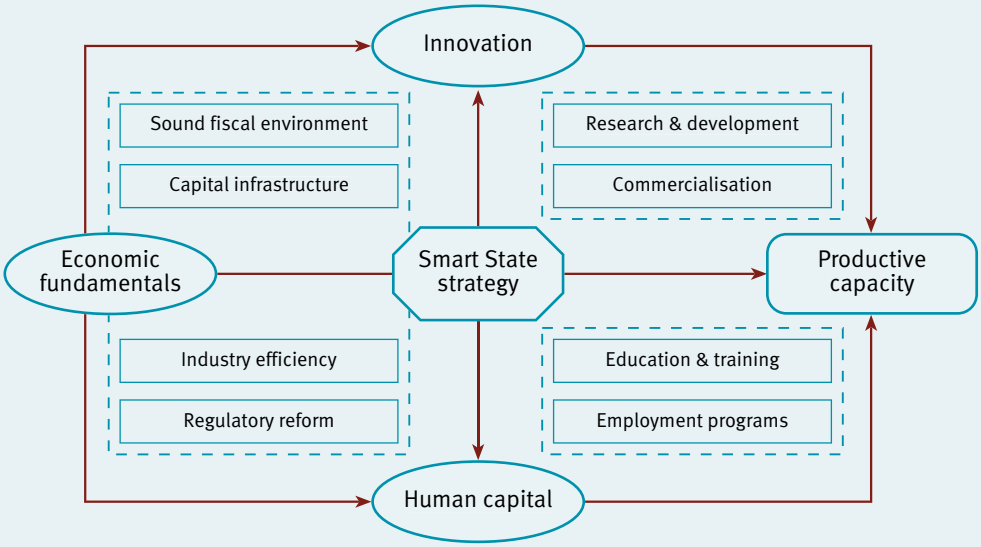
Queensland's economic strategy

The Smart State vision for improving living standards

Queensland's economic strategy is focused on raising the productive capacity of its labour force and industries, with productivity growth leading to higher rates of sustainable economic growth, improved living standards and greater employment opportunities – key economic and social policy priorities of the State Government.

The State Government's economic strategy complements sound economic fundamentals with a Smart State strategy that fosters innovation and invests in human capital. These factors are the primary drivers of productivity growth in a service-based economy, as highlighted by *Productivity and Regional Economic Performance in Australia*. The following figure gives a diagrammatic representation of the Queensland Government's economic strategy.

Queensland's economic strategy



The maintenance of sound economic fundamentals forms the basis of the economic strategy. In particular, the State Government is focused on maintaining a sound fiscal environment, ensuring an appropriate infrastructure base, improving industry efficiency and regulatory reform, to enable industries and businesses to make effective and efficient investment decisions. Sound economic fundamentals are also crucial to supporting other key drivers of economic growth, such as innovation. For instance, regulatory reform and improved industry efficiency and competitiveness create greater incentives for firms to use innovation as a source of competitive advantage.

Fostering innovation is at the heart of the Smart State strategy. This strategy aims to support the development and adoption of new technologies to raise productive capacity and competitiveness in established industries, such as mining and agriculture. It also aims to diversify the economy by fostering innovation in emerging areas of technological opportunity where Queensland has a competitive advantage, such as biotechnology. The innovation strategy involves providing R&D infrastructure to raise the innovative capacity of the economy, forging public-private partnerships that ensure public sector innovations are developed into commercial products that benefit the community, and ensuring an environment conducive to successful private sector innovation.

Human capital, as a driver of innovation, productive capacity and economic growth, is also central to the Smart State strategy. The Government is focused on educating and skilling people so that they have the best opportunity to compete for and create jobs in new and emerging fields, as well as applying their skills to revitalise and advance the growth prospects of traditional industries. The human capital strategy focuses on education, training and employment programs that promote successful labour market participation and provide more Queenslanders with the opportunity to make a valuable contribution to society and to share in the benefits of economic progress.

Chapter 3 of the Budget Strategy and Outlook, which forms part of the 2003-04 State Budget, provides a more detailed discussion of the Government's economic strategy.

Increasing productivity in new and traditional industries

One of the important pieces of analysis included in *Productivity and Regional Economic Performance in Australia* is an explanation of interstate differences in economic performance. This analysis finds that, despite Queensland being less reliant than other states on those industries that recorded the fastest growth nationally, this is more than offset by advantageous regional effects, with most industries in Queensland having recorded higher growth rates than the same industries nationally. As a result, overall economic growth in Queensland has outpaced national growth during the past 15 years.

These results suggest that, in addition to developing new firms and industries, the main source of economic growth derives from general growth in productivity and employment within existing industries. Indeed, an important policy message that has emanated from analysis of the 'New Economy era' is that improved economic performance relies not only on developing new industries but, more importantly, using the latest technology and resources to increase productivity across all industries, both traditional and new.

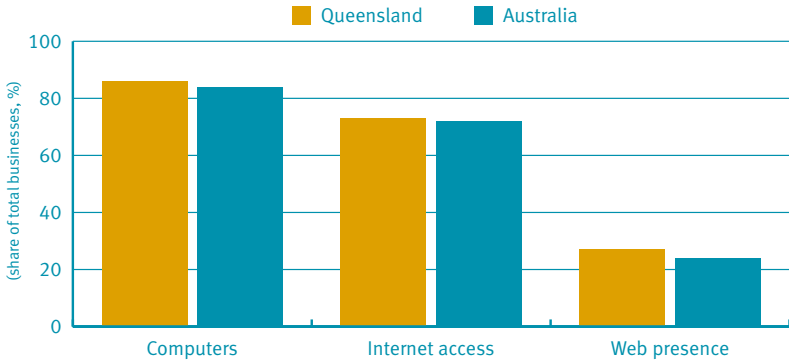
The Queensland Government's investment attraction program also aims to promote general growth in skills, productivity and employment across all industries. It aims to encourage and facilitate domestic and international investment in various industries, including aviation, biotechnology, information and communication technologies (ICT), manufacturing and mining, and also promotes increased awareness of Queensland, including regional Queensland, as an attractive location for business investment.

Fostering more dynamic industries

The sectoral analysis contained in *Productivity and Regional Economic Performance in Australia* indicates that Queensland industries have been relatively successful in adapting to changing circumstances. Major challenges to which Queensland industries have responded include:

- A changing policy environment at the state, national and international levels, marked by the introduction of a range of pro-competition measures. These policy changes were generally seen as adversely affecting inefficient operations relying on regulation and protection, and benefiting more efficient competitive businesses. Significantly, reflecting the efficiency and flexibility of Queensland businesses relative to those in other states, this program of microeconomic reform is considered to have provided a net benefit to Queensland compared with the rest of Australia.
- The 'information revolution', which resulted in rapid advances in ICT. Research by the OECD and others has shown that ICT investments have boosted economic growth in both ICT-using as well as ICT-producing countries during the past decade, and Australia is among the leading countries in extracting value from ICT investment. Queensland's performance in this regard equals and, in some respects, exceeds that of the rest of Australia. Figure 2 shows the State had a higher share of businesses that used computers, had internet access and had a web presence in 2001-02, compared with the national average.
- The changing nature of export markets. Queensland's traditional export industries have shown ingenuity in engaging in alternative export destinations, particularly following the Asian financial crisis. Coal exports rose by 56% between 1996-97 to 2001-02, with producers securing substantial growth in exports to emerging markets such as Spain, Germany and South Africa. Similarly, the tourism sector was able to offset falls in visitor numbers from regions most affected by the Asian financial crisis by attracting increased visitor numbers from Europe, the UK and US. Visitors from these regions tend to holiday longer than their Asian counterparts, actually raising the overall income generated by the tourism sector.

Figure 2: Business use of information technology, 2001-02



Source: ABS 8129.0

These experiences suggest a continuing need to design market-oriented policies that assist firms to meet threats and take advantage of opportunities presented as a result of current and emerging areas of comparative advantage. *Productivity and Regional Economic Performance in Australia* points to three examples of appropriate policy design in this respect.

1. **A focus on 'regulatory innovation', as distinct from deregulation.**

   This approach recognises that industry structures evolve over time and hence regulations need to be constantly monitored to ensure that they meet an industry's requirements (i.e. its stage of evolution). For example, pro-competition regulation may hamper the development of new industries, where a steady and reliable profit stream is necessary to provide an incentive for innovation and investment. However, at later stages of industry development, pro-competition regulation may be necessary to foster innovation and ensure that the associated benefits are passed on to consumers.

   Reflecting this approach, the Queensland Government has established the Business Regulation Review Unit in the Department of State Development, which monitors regulation as well as seeking to improve the efficiency with which regulations are administered.

2. **Assistance to firms should focus on capacity building by providing improved access to technologies, organisational advice and R&D assistance.**

   This is the focus of the Queensland Government's industry development agencies. In particular, the Government's policy to promote ICT industry development in the State, as outlined in the December 2001 ICT Industry Directions Statement, is aimed at encouraging the innovation process; increasing the uptake of ICT in business, government and the community; offering various forms of support (e.g. regulatory, financial, infrastructure) to specific industry segments; and assisting in the development of ICT companies in regional Queensland.

3. **Adjustment assistance should focus on compensating employees for the loss of specific human capital, as well as supporting re-skilling and development, in order to provide new entrepreneurial opportunities and avoid losses of human capital.**

   An important example of the application of this principle by the State Government is the Breaking the Unemployment Cycle initiative. One program within this initiative is the Worker Assistance Program, which is an early intervention employment program that provides assistance to workers made redundant through large-scale retrenchments. This assistance includes training and skills development to help them meet the needs and opportunities of the local labour market, job preparation assistance, wage subsidies and relocation assistance.

   Since its inception in September 1999, around 4,000 people have been assisted by the Worker Assistance Program, with more than 70% of the assistance provided in regional Queensland. The program played an integral part in assisting Queenslanders affected by the collapse of Ansett, with 1,021 of the 1,550 Queensland residents who were laid off receiving assistance.

Innovation and productivity growth

Several chapters in *Productivity and Regional Economic Performance in Australia* underline the importance of innovation to economic growth. Innovation is the process of converting ideas and knowledge into goods or services valued by the community. Private sector firms innovate by creating new or improved products for consumers or developing more efficient production processes. In both cases, innovation generates greater income from given resources, and is thus a primary source of productivity growth, improved living standards and enhanced job opportunities. Fostering innovation forms a core part of the Government's Smart State vision and broader economic strategy (see page 8).

Public sector innovation generally focuses on areas with important social benefits, such as environmental protection and health care, again providing a crucial source of improvement in living standards. In addition to its direct involvement in innovation activity, the Government plays an important role in supporting factors that underpin the extent of innovation activity. These factors include:

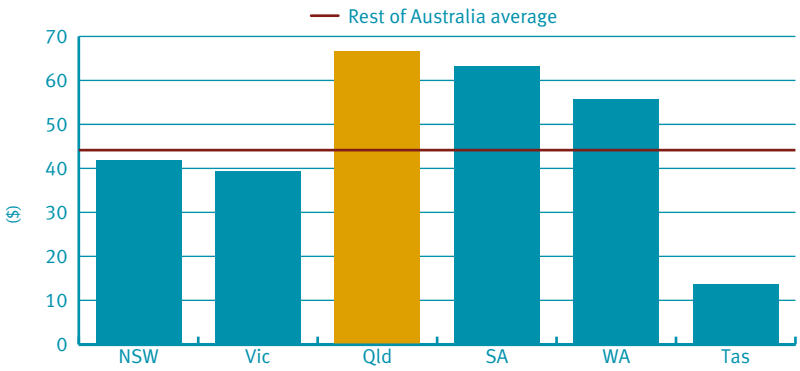
- the incentives facing potential innovators, such as the returns from innovation (influenced by intellectual property and taxation arrangements), the costs of implementing innovation, and the competitive environment driving innovation in organisations;
- the institutional capacity of the innovation system, including the availability of infrastructure, skills, and opportunities for collaboration between researchers, financiers and entrepreneurs; and
- the culture of innovation, where individuals innovate in order to improve their situation and solve problems. There are a number of elements to an innovative culture including personal freedom and equality of opportunities to innovate, diversity in all its dimensions, curiosity, attitudes to risk, social desire for improvement, a high value placed on education and a readiness to accept change.

Productivity and Regional Economic Performance in Australia emphasises the need to support all stages of the innovation process, such as R&D, commercialisation, entrepreneurship and technology diffusion.

Research and development

R&D represents an important input to the innovation process. The Queensland government has taken an active role in this area: in 2000-01, R&D expenditure by the Queensland government ($240.3 million) surpassed that of Victoria ($187.7 million) and was only marginally less than that of New South Wales ($274.0 million). Figure 3 shows that, on a per capita basis, State government expenditure on R&D in Queensland exceeded that of any other State and was almost 50% higher than the average for the rest of Australia in 2000-01.

Figure 3: State Government R&D expenditure per capita, 2000-01



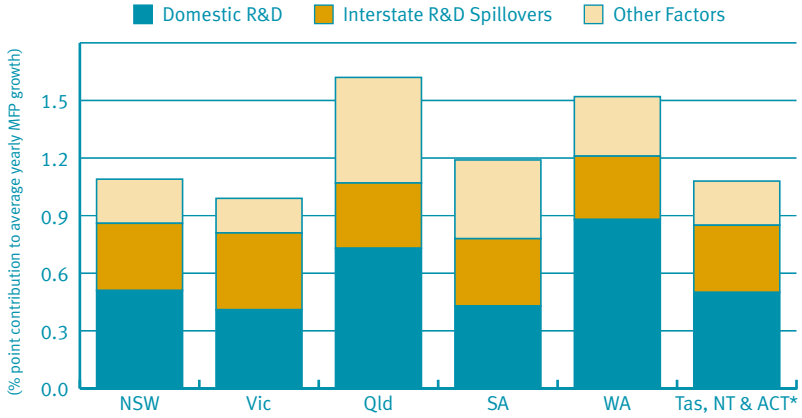
Source: ABS 8112.0, ABS 3101.0

Queensland has also outperformed the rest of Australia in terms of growth in R&D spending by business, higher education institutions and Commonwealth and state governments during the decade to 2001-02. Both business and higher education expenditure have grown around 50% faster (13.5% and 10.5%) compared with the rest of Australia (8.2% and 7.1%, respectively). However, this faster growth

in Queensland partly reflects the fact that these expenditures have grown from a smaller base in Queensland relative to New South Wales and Victoria.

Productivity and Regional Economic Performance in Australia draws attention to the importance of business innovation activity in explaining interstate differences in economic performance. This research shows that growth in business R&D spending could, on average, explain 60% of labour productivity growth across the Australian states during the past 15 years, with the states that recorded the highest growth in business R&D, such as Queensland and Western Australia, generating the highest productivity growth (see figure 4).

Figure 4: Contribution of innovation to MFP growth, 1985-86 to 1999-2000

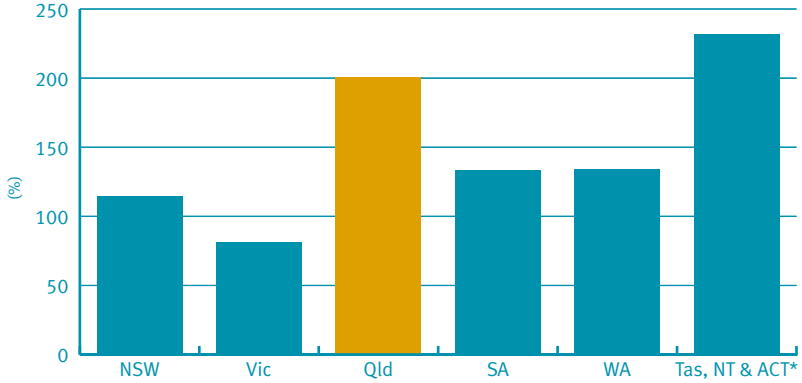


** Business R&D data provided by the ABS are not disaggregated between Tasmania, the NT and ACT*

Source: Queensland Treasury

Analysis in *Productivity and Regional Economic Performance in Australia* also highlights the high economic returns to the State from business R&D investment. Figure 5 shows that the return in Queensland in 1999-2000 was in the order of 200%, meaning that an additional $100 investment in business R&D in Queensland would raise output in the State on average by $200. Queensland was estimated to have one of the highest returns to business R&D of the states in 1999-2000, suggesting significant economic benefits could be reaped from greater business sector investment in R&D in Queensland.

Figure 5: Returns to business R&D, 1999-2000



** Business R&D data provided by the ABS are not disaggregated between Tasmania, the NT and ACT*

Source: Queensland Treasury

The Queensland Government's innovation strategy focuses on developing a strong R&D infrastructure base, acknowledging the importance of R&D activity to productivity and economic growth in Queensland. Two of the major initiatives fostering R&D are the following:

- The Queensland BioIndustries Strategy is a $270 million 10-year strategy, established in May 1999, to position Queensland as a centre of excellence in biotechnology. This reflects Queensland's competitive edge in this emerging growth industry, with the State's diverse natural resources providing an advantage in the development of products that will benefit society in areas of health care, disease prevention and cure, food production and the protection of the environment.

  As part of this strategy, $15 million has been committed to infrastructure and $77.5 million in operational funding over 10 years for the Institute of Molecular Bioscience – the largest biotechnology research institute in Australia. This institute was officially opened in May 2003, as part of the launch of the Queensland Bioscience Precinct at the University of Queensland. The institute is a world-class research facility that will provide economic and social benefits across industries including agriculture, health, food, mining, environmental management and manufacturing.

- The Smart State Research Facility Fund (SSRFF) is a $150 million fund to assist in the construction of world-class science and technology R&D infrastructure. Funding of $63 million was allocated to six projects during the first round of the SSRFF in 2001-02, including up to $22.5 million toward the establishment of a $70 million Institute of Health and Biomedical Innovation at the Queensland University of Technology. This institute will conduct research into injury prevention or rehabilitation, health development, advanced diagnostics, molecular farming, tissues bio-regeneration and vision improvement.

  The Government has also announced support for six major R&D projects under the second round of SSRFF funding (2002-03). This includes up to $12 million towards an Institute for Cellular and Molecular Therapies, as part of the Natural Product Discovery research facility at Griffith University. This institute will conduct research into drug design linked to cellular and molecular therapies for a range of human diseases.

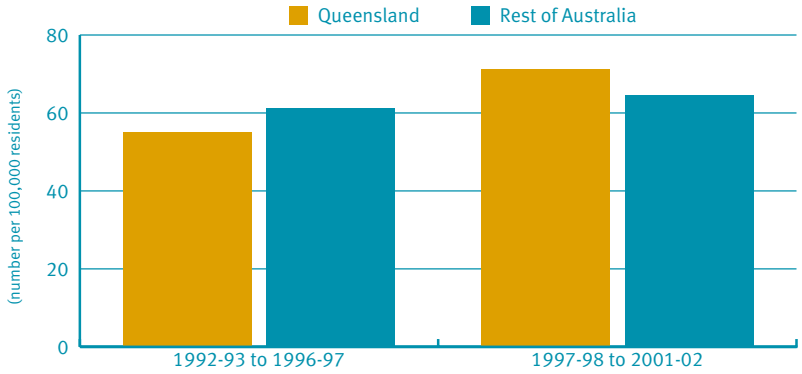
Commercialisation and entrepreneurship

Productivity and Regional Economic Performance in Australia also stresses the role of other aspects of the innovation system. In particular, while R&D forms an input into the broader innovation process, it is commercialisation that determines whether R&D efforts lead to successful innovation. Any new product or process an organisation creates in its R&D stages must be effectively marketed and distributed if it is to be successful in the market place. Entrepreneurship is fundamental to this stage, with commercialisation requiring the creative and risk-taking ability to link new products or processes to market opportunities.

One indicator of the commercial potential of innovation is patent counts. A product or process that meets the criteria of being new, inventive and capable of creating commercial gains can be patented. This patent represents a right that prevents others from using the invention for a fixed period or requires the payment of royalties for its use.

In particular, the number of patents granted per head of the population is often used to indicate the inventiveness of individual economies. Figure 6 illustrates that, although Queensland scored slightly lower on this ratio relative to the rest of Australia during the five years to 1996-97, Queensland surpassed the rest of Australia in terms of the number of patents per capita during the five years to 2001-02.

Figure 6: Annual average patents granted per 100,000 residents



Source: Intellectual Property (IP) Australia and ABS 3101.0

The creation of new start-up firms is an important way in which new products and services become available and is one indicator of entrepreneurship. In 2002, 12% of Queensland adults were defined to be engaged in entrepreneurial activity, well above the national average of 8%.

Given the importance of commercialisation and entrepreneurship in the innovation process, the Queensland Government has implemented a range of policies to foster the further development of innovative ideas and concepts:

- **Cooperative Research Centres (CRCs)** bring together universities and private and public sectors to maximise the commercial and community benefits from public R&D efforts. The Government has established a fund to assist Queensland applications to the Commonwealth CRC Program and almost one-quarter of national CRCs now have their headquarters in Queensland. Most recently, $1.8 million has been provided over seven years to a CRC for Sugar Industry Innovation through Biotechnology. Queensland CRCs cover industries such as manufacturing, ICT, mining, energy, agriculture and medicine.
- **The Innovation Start-Up Scheme (ISUS)** provides seed funding to assist highly innovative start-up companies in commercialising their new technology products or services. To date, funding has been awarded to 40 projects across areas such as ICT, biotechnology, electronics, mining, environment, health and medicine, with almost half the recipients from regional Queensland.
- **BioStart** represents a $3 million program providing funding for biotechnology companies to progress research to a 'proof of concept' level. The success of BioStart has encouraged government to widen the initiative to include other industries besides biotechnology. BioStart will be complemented by **teQstart**, which will provide funding for early stage innovative companies across a range of industries such as information and communication technology, environmental management, engineering, electronics, health and medicine, nanotechnology and advanced materials.

  The establishment of programs such as ISUS, BioStart and teQstart reflects growing evidence that a lack of venture capital presents a major impediment to high-technology start-ups – a crucial part of the commercialisation and entrepreneurial process.
- **Commercial Incubators** currently funded by the State Government include the 'iLab' technology incubator and the Sunshine Coast Innovation Centre. These incubators provide accommodation, office facilities and business and legal management support to help private sector spin-off companies from universities or other research institutes to convert their R&D efforts and ideas into commercially viable products and services. A third incubator designed for more mature biotechnology companies, named the BioAccelerator, will be constructed at the Brisbane Technology Park.

The Government has also taken a lead role in establishing the Australian Institute of Commercialisation as a national institution supporting the commercialisation process through industry. The Government also encourages entrepreneurship through its support for information and training programs in relation to commercialisation. One example is the *Ideas 2 Market* website at www.ideas2market.qld.gov.au.

Technology diffusion

Technology diffusion is the dissemination of technical information and knowledge and the subsequent adoption of new technologies and techniques by users. Technology diffusion is perhaps the most important part of the innovation system, especially given innovation in Australia often derives from R&D conducted elsewhere. Technology diffusion is primarily supported by an appropriate business environment, legal system (intellectual property protection) and the availability of skills and information.

Trade flows are an important channel for technology diffusion, while R&D devoted to absorbing technologies developed elsewhere is also crucial. Queensland's greater openness to trade and strong growth in business R&D during the past decade have placed the State in a good position to capitalise on international technological innovation. There are several examples of where the State Government is fostering technology diffusion:

- Industry clusters are either geographic or virtual concentrations of interrelated firms with common needs for human capital, technology and infrastructure. The State Government supports technology diffusion in industry clusters in e-security and e-learning. The e-security cluster in Queensland has 36 members, and has attracted interest from multinationals such as IBM. The e-learning cluster includes 126 companies and has formalised an organisational structure, developed membership rules and implemented a policy for intellectual property developed by the cluster.
- The Queensland Manufacturing Institute (QMI), located at the Brisbane Technology Park, is a nationally recognised provider of best practice technology diffusion services. It provides a world-class manufacturing, applied research and advanced technical training facility available to the manufacturing industry and business, particularly in relation to helping firms achieve manufacturing excellence by adopting world-class technologies and business practices.

Innovation initiatives for the future

The Queensland Government has progressively introduced a wide range of initiatives aimed at fostering further innovation in Queensland. *Queensland the Smart State – Investing in Science, Research and Innovation* details the State's investments in science, research and innovation over the past five years and evaluates Queensland's performance in achieving the Smart State vision.

This document also outlines a comprehensive four-year Smart State strategy, which includes an additional $100 million investment in fostering innovation across key areas in Queensland's new and traditional industries. These include:

- research - medical, cancer, biodiscovery and microtechnology
- tropical marine science
- clean coal technology
- e-health and e-security
- supercomputing
- business incubation
- skills development
- developing existing industries
- precinct for knowledge industries and community living
- sports science.

6 Education, training and human capital

The importance of human capital

There has been growing recognition of the importance of human capital to economic growth. This is confirmed in *Productivity and Regional Economic Performance in Australia*, where it is estimated that differences in human capital, as measured by education completion rates, explained 87% of the difference in GSP per capita between Queensland and New South Wales. It is calculated that Queensland could have gained an additional $14.7 billion in GSP, or about $5,652 per capita, if it equalised its human capital stocks with New South Wales in 1996.

The term human capital refers to the stock of knowledge, skills and attributes available in the workforce. A range of knowledge, skills and attributes is important, including technical skills, attitudes and general skills such as literacy and numeracy, creative thinking, communication skills and the capacity for lifelong learning.

Increases in human capital are a crucial driver of better employment outcomes, productivity growth and higher living standards in an economy. Table 1 shows how people with relatively higher education qualifications tend to have better labour force outcomes. For instance, persons who only complete Year 10 or below have average unemployment and participation rates of 10.2% and 60.5% respectively, compared with 2.9% and 87.5% for persons holding a bachelor degree.

Table 1: Labour force outcomes by education level, Australia, 2001

Highest level of education attainment	Labour force outcomes	
	Unemployment rate	Participation rate
Postgraduate degree	2.9	91.0
Bachelor degree	2.9	87.5
Advanced diploma / diploma	4.8	82.4
Year 12	7.0	76.4
Year 10 or below	10.2	60.5

Source: ABS 6227.0

Human capital can be enhanced by formal education and training, informal training (including work and life experience), increased participation in the labour force and immigration. Similarly, human capital can be diminished by adverse labour market experiences, such as long spells of unemployment or withdrawal from the labour force, and emigration.

The relationship between innovation and human capital

Productivity and Regional Economic Performance in Australia also stresses the interrelationship between innovation and human capital. Innovation adds to human capital, either directly, through R&D activity, or indirectly, by attracting highly skilled people into the economy.

Similarly, human capital influences productivity growth through its effect on innovation, as it is people's analytical and creative skills that determine the rate at which an economy can create better products, or absorb and improve on technology developed elsewhere.

Investment in human capital, as a driver of innovation, productivity and economic growth, forms a core part of the Government's Smart State vision and broader economic strategy (see page 8).

Education and training

Productivity and Regional Economic Performance in Australia outlines several policy principles in relation to investing in human capital. An important theme is the composition of investment in human capital. The book advocates early childhood education, given its importance to lifelong learning, with early investment in human capital promoting investment in education and skills upgrading through later stages of life.

Similarly, the book emphasises secondary level completion as a driver of material living standards, with three-quarters of the impact of human capital on economic performance relating to high-school completion. Finally, higher standards in basic literacy and analytical skills are proposed, given their importance as sources of knowledge, invention and economic growth.

Several of these issues are being addressed in the Government's Queensland 2010 State Education strategy and Education and Training Reforms for the Future (ETRF) package. The education strategy outlines a vision to advance public education in order to meet the unique challenges posed by the transition to a globalised knowledge economy. A key objective of this strategy is raising the Year 12 completion rate from 68% in 1998 to 88% by 2010.

The ETRF package provides funding to operationalise the Queensland State Education 2010 vision by implementing a range of initiatives in the early, middle and senior years of schooling aimed at raising high-school completion rates. Among the reforms, a full-time preparatory year before Year 1 of school is being trialled, while a new target for Queensland students to achieve national Year 7 literacy and numeracy benchmarks by 2005 has been proposed.

The ETRF strategy also aims to broaden pathways to further education and work, by providing more flexible options for students, such as a wider range of tailored courses and more school-based apprenticeships.

Employment programs

Employment programs also form a key part of the State Government's strategy to raise human capital. The *Breaking the Unemployment Cycle* initiative encompasses a range of programs aimed at improving job opportunities for the long-term unemployed, groups at risk of long-term unemployment, including youth and mature aged, and other disadvantaged job seekers.

The initiative plays a crucial role in increasing the State's overall human capital and the productive capacity of Queensland's labour force by providing disadvantaged job seekers with opportunities to develop skills through on-the-job training. The initiative's focus on long-term unemployment is also consistent with evidence that long durations of unemployment can have a de-skilling effect.

As part of the 2003-04 State Budget, the Government committed a further $255 million in funding to extend the initiative through to 2006-07. The initiative's target was to provide 56,000 apprenticeships, traineeships and job placement opportunities over the six years to June 2004. The initiative has already exceeded this target, with over 58,000 placements secured as at June 2003. The initiative has also had a strong regional emphasis, with around 40% of those assisted living in regional Queensland.

Intergenerational Research project

Further research into the drivers of economic growth

An important long-term issue confronting Queensland is the economic, social and fiscal impacts of demographic change. It is projected that the Queensland population will continue to age over the next 50 years, as fertility rates move below the replacement level and life expectancy continues to increase.

The State Government has initiated a whole-of-Government research program to analyse the long-term sustainability of State finances and Queensland living standards in the context of demographic change.

A key finding of the project is the importance of the growth of productive capacity and workforce participation to the welfare of Queenslanders over the long-term. Put simply, an ageing population means that the share of the population actively working will slowly decline. As a result, the dependency ratio, i.e. the ratio of the dependent population (those aged 0–15 years plus those aged 65 years and over) to the working age population (those aged 15-64 years), will increase (see table below). This highlights the need to offset this trend through policies that raise productivity growth and encourage labour force participation in order to maintain strong growth in overall living standards.

Queensland's population (proportion of population by age group and dependency ratio)

Age group	1971	2001	2031
0-14 years	29.8	21.3	15.8
15-64 years	61.5	67.1	62.2
65 years and over	8.8	11.6	22.0
Dependency ratio	62.7	49.1	60.8

Source: ABS 3101.0 and OESR unpublished projections

The project has identified several demographic issues that stress the increased importance of raising long-term productive capacity and workforce participation:

- The age structure of the workforce itself could influence productive capacity. On average, older workers are more productive because long-term participation in work builds skills. This means that the human capital currently residing within the large baby-boomer age group will be difficult to replace when this generation retires from the workforce.
- Internal migration flows have been characterised by younger people moving to urban areas, raising the share of older people in rural Queensland. This implies that the extent of population ageing will differ across regions, having policy implications for service delivery and regional development.
- Overseas and interstate migration will become more important sources of labour supply and productive capacity in Queensland. Natural increase (births less deaths) will decline as a source of population growth over the next 50 years, due to falling fertility rates. Policies that attract skilled migrants to the economy, as well as training and employment programs for migrants, will become even more important in this respect.

Several policies within Queensland's current economic strategy aim to raise long-term growth in productivity and living standards in the context of population ageing. For instance, the Education and Training Reforms for the Future package for secondary schooling aims to maximise the productive capacity of the current generation of youth who will reach their prime years of working life as the baby boomer generation retires. Similarly, a commitment to building a strong research and development infrastructure base in Queensland will raise the State's innovative capacity as well as attract skilled labour to Queensland. Finally, employment programs under the Breaking the Unemployment Cycle initiative aim to skill and educate those at risk of repeated or long-term unemployment spells, helping to raise the long-term potential for labour market participation.

The Intergenerational Research Project is continuing to evaluate the potential impacts of population ageing on the Queensland Budget and economy. Additionally, Queensland Treasury is liaising with other state and territory Treasuries to evaluate the implications for Australia's states and territories as a whole.

Securing Queensland's future

The research papers contained within *Productivity and Regional Economic Performance in Australia* comprise an initial deliverable from Queensland Treasury's Drivers of Economic Growth project and clearly identify factors likely to drive Queensland's economic growth in the future.

However, the State Government also faces several new challenges and opportunities in its endeavours to further improve the living standards of current and future generations of Queenslanders. In particular, intergenerational issues, greater globalisation and an evolving industry structure will all have major implications in terms of the State's future policy directions.

The Government is already addressing these issues through its proactive approach to planning for Queensland's future, as reflected in the State's economic strategy, detailed in the 2003-04 State Budget, and through various components of the Smart State strategy.

The State's changing demographics – in particular, the ageing of the population over the first half of the 21st century – present a particular challenge with regard to further developing the State's human capital.

In response to this issue, the ETRF package for secondary schooling is aimed at improving the future productive capacity of today's youth. Components of the Breaking the Unemployment Cycle initiative also aim to improve the future productive capacity of those people at risk of repeated or long unemployment spells through reskilling and education programs. In both cases, these policy initiatives help to boost the long-term potential for labour market participation and will therefore ultimately facilitate an increase in individual living standards.

An increasingly globalised economy also highlights the importance of the Government's current policy stance of encouraging the development of a more diversified domestic economy, a crucial consideration in building a Queensland economy that can remain resilient in the face of future external shocks.

The Smart State Strategy aims to continue to diversify the economy by supporting the development and adoption of new technologies and skilling individuals, in order to advance the growth prospects of both traditional industries and areas of emerging technological opportunity. This is particularly important in areas where Queensland's diverse natural resources provide the basis for a competitive advantage (e.g. biotechnology).

The way forward

Existing policy responses already being implemented by the Queensland Government that seek to capitalise on the opportunities created by these evolving issues will be complemented by two further components of the Drivers of Economic Growth project.

Firstly, the Intergenerational Research project is a whole-of-Government research program analysing the long-term sustainability of the State's finances and living standards in the context of demographic change (see page 18). Secondly, another detailed research project that aims to measure and improve productivity in the service sector is also under way.

The results of these projects, together with further research emanating from the Drivers of Economic Growth project, will make a substantial contribution to the Government's ongoing efforts to develop effective and forward-looking policy solutions in order to provide a better quality of life for all Queenslanders.

Queensland Government
Treasury