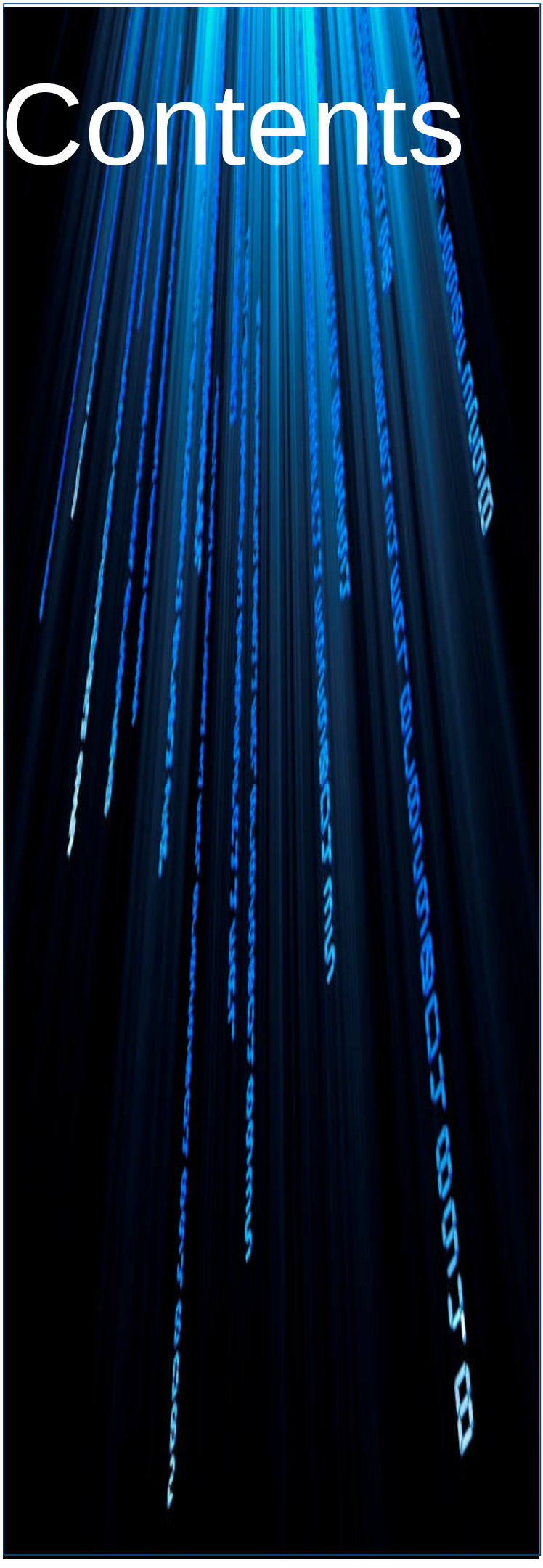
Communication Alliance
Economic Impacts of Broadband for Australia and Globally
December 2008
Possibilities and opportunities in a digital world

Disclaimer

This report has been prepared by PricewaterhouseCoopers (PwC) on behalf of the Communication Alliance. The report has been focused on considering the economic benefits which may accrue in Australia following from investment in broadband infrastructure. Importantly, the following analysis has not made any economic projections. It has however, reviewed the available literature to consider the size of benefits potentially available from broadband. The title, possibilities and opportunities in a digital world, has been chosen to reflect the uncertainties associated with the economic impact associated with broadband. Unlikely any other technology broadband infrastructure has the potential to fundamentally change the manner in which the economy undertakes the majority of its transactions. This shift in turn drives the need of greater and greater download speeds.

There is relatively little empirical evidence of the economic impact of broadband, although research is growing. In part this is because the impact on the economy occurs indirectly as it acts on variables that, in turn, are drivers of growth. As such the estimates contained in this report are likely to represent a conservative base assessment of economic growth. Once the cumulative impact of investments in information technology communication and broadband are taken as whole the likely impacts will equate to significantly more than the estimates contained in this report. However, this has not been assessed in this report.

PwC has not audited, nor makes any assurance regarding the underlying data contained in this report. All estimates are attributed to the individual authors, any person wishing to rely on these estimate should consult the original source text for the underlying assumptions regarding these estimates.



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Key Findings

Economic Growth

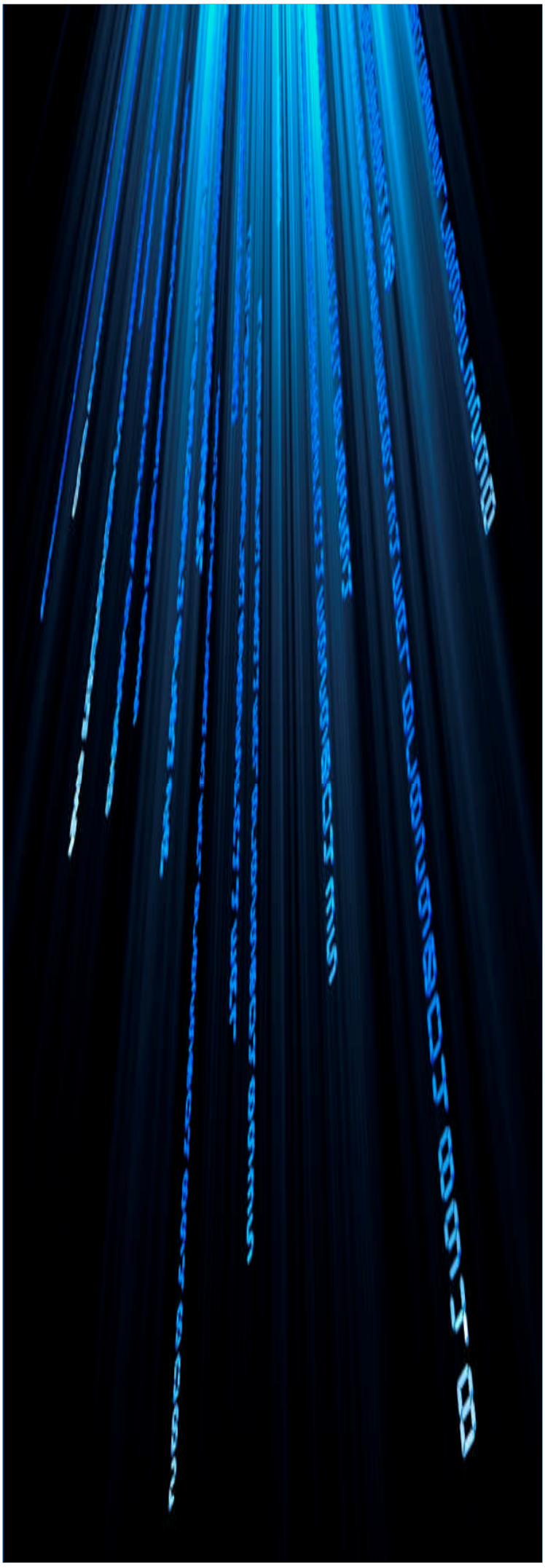
Our review of the available literature suggests that broadband infrastructure capable of speeds of 10 Mbps is likely to have a positive economic impact on the Australian economy of approximately 1 to 2 per cent of GDP per annum.

Productivity benefits

Studies have suggested that productivity is likely to be approximately 1 per cent per annum higher than it would other be without widespread broadband penetration.

Welfare benefits

The welfare benefits are at least equal to the benefits available in terms of GDP growth. The ongoing and multiplicative impacts of these benefits will also be considerable and will lead to greater economic benefits than those stated.



Executive Summary

Executive Summary

The internet has fundamentally changed the way that the Australian economy interacts with other economies throughout the world. These changes have been rapid and have led to a world which seems obvious to us now to the point that one cannot imagine a time when we did not email or Google our information. However, for some industries entire business models have been made redundant, i.e. through the exchange of a data file containing intellectual capital of a music artist or the resulting movie product of hundreds of millions of dollars investment.

The growth of the internet has not only changed the manner that economies, businesses, and individuals interact with one another, it has also arrived at a pace previously unseen. The demands of users and the graduation from dialup, to ADSL, to ADSL2+, to the development of a fibre to the node (FTTN) network, have resulted in a hedonic price change. That is, while the price of the service has remained relatively constant, the quality of services delivered and expected has increased, showing no sign of decreasing.

However, this growth has not been without its limitations. The internet and all the services which it provides is struggling with its own infrastructure, as evident with the looming exhaustion of the Internet Protocol Version 4 (IPV4) web addresses. This is further being limited by the inability to agree on the replacement coding which will power the web. The other limitation is on the amount of bandwidth available to users. That is, the roll out of broadband infrastructure capable of providing the next generation of services, with constant speeds of greater than 10 Mbps.

Australia continues to rank in the middle in terms of broadband infrastructure in developed counties, albeit above the OECD average in terms of broadband subscribers. The National Broadband Network (NBN) will go some way to addressing this. However, both investment, and the benefits of broadband, need to be viewed in the context of:

- What investment other countries are undertaking
- Australia's existing base line of telecommunication infrastructure, and
- The requirement to pass 98 per cent of the population.

The NBN and all broadband investments, irrespective of delivery platform, are likely to result in significant gains to the Australian economy. Our review of the studies associated with broadband investments suggests that the expected growth in Gross Domestic Product (GDP) is between 0.3 per cent per annum and 3 per cent per annum. The upper end of the range is high given that most studies assume that this is likely if no other country invests in broadband technologies. A more likely range of outcomes, which assumes that other nations also invest in broadband, is 1 to 2 per cent. Further, there is a significant correlation between broadband investment and economic growth at a regional level.

A review of employment and wage growth suggests that there is no correlation with broadband and growth in these areas. This result is most likely to be driven by the fact that most jobs continue to be done and required by the economy albeit in an online environment which captures and records all actions associated with this particular employment. The absence of jobs growth is supported by the absence of real wage growth which suggests that while no additional jobs are created there is an absence of pressure on wages.

Most Australian estimates, which predicted additional annual employment of between 0.1 to 0.8 per cent are lower than overseas studies, which predicted between additional employment growth of 0.4 to 1.4 per cent. This has been in the context of close to a full employment economy. These estimates may differ in an economy which is slowing.

Our review of wage growth suggests that there is no correlation with broadband and growth in wages. Whilst broadband is thought to enhance growth and thus create employment opportunities, it also facilitates capital-labour substitution, slowing employment growth, at least for a while. Furthermore, as broadband is likely to affect different industries in different ways it is likely there will be some sectoral and occupational employment changes and, as a result, the net effect on total employment is hard to identify.

However, there is likely to be significant growth in terms of productivity. Studies have suggested that productivity is likely to be around 1 per cent per annum associated with broadband penetration. In addition, there is likely to be significant gains to employees through the avoidance of real costs such as commute time which may lead to greater social cohesion. The multiplier affects of these gains are likely to exceed those presented in this paper.

Executive Summary

The full impact of changes in the workplace and welfare increases is difficult to quantify in absolute terms. Further, one of the biggest impacts by far in terms of broadband deployment has been the facilitation of a more connected world. Effectively broadband fuels globalisation which impacts on all aspects across the economy.

This globalisation is resulting in the need for economies to become more agile than in previous decades. That is, globalisation and the mobility of workers has lead to a more level playing field in terms access to substitute labour and cheaper prices. This in turn has the potential to significantly increase the returns available to capital owners, and reduce the cost of goods for individuals in the economy. However, this is not without costs. For example the structural changes that this drives and the dislocation of affected workers has the potential to have long lasting social impacts. At the same time, if managed correctly, this structural change will lead to a more effective use of capital and greater returns which are then available to share between capital owners and workers. Assuming that it leads to significant improvements, wages and economic growth are likely to increase as a result of the changes.

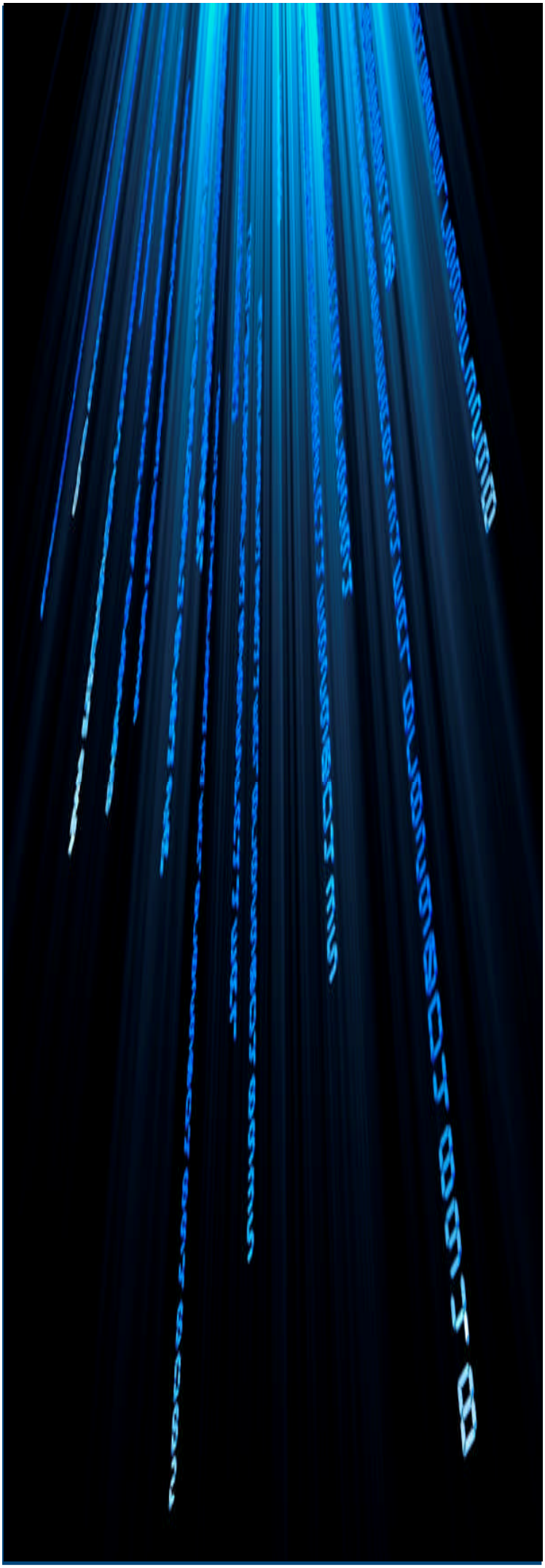
In addition to these benefits, consumers will pay less for goods and services resulting in a step change in consumption as these consumers are now able to afford goods deemed to be previously discretionary. That is, the economic benefits of this lower cost environment leads to an increase in the utility of all consumers. Welfare increases are likely to be at least equal to economic benefits discussed in the previous chapter.

Conditions for maximising the economic benefits of broadband

The Australia environment for broadband infrastructure has undergone significant growth over the past five years. Since 2005 the number of broadband subscribers has been higher than the OECD average. However, Australia still lags behind a number of countries in terms of broadband speeds.

The review of the literature has suggested that the next generation of broadband is required to unlock further economic benefits to the Australian economy. That is, speeds of at least 10 Mpbs. Assuming that this situation is addressed and that Australians have access to the necessary speeds to unlock the potential economic benefits of broadband, there are a number of conditions which will need to addressed:

- Australia will need to ensure that combined with the investment in infrastructure there is an investment in skills and training to ensure that all sectors within the economy are able to participate in the economic growth discussed throughout this report.
- There is a regulatory and competitive environment whereby there is the necessary returns on investment to ensure that service providers have the necessary incentive to invest in the infrastructure required to support consumers.
- There is support from government in terms of becoming a key player in the adoption of broadband enabled technologies to deliver services.
- There is a degree of competition between infrastructure providers to ensure that consumers tastes and preferences are appropriately catered to. For example, consumer preference may be for convenience over speed, as such there is a need to ensure that there is the necessary interconnection between the competing technology platforms.



Introduction

Introduction

The assumed (and oft-touted) economic impacts of broadband are real and measurable… Broadband does matter to the economy. Broadband is clearly related to economic well-being and is thus a critical component to our national communications infrastructure.

MIT (2006)

The internet has revolutionized the way that businesses contract and communicate with customers and suppliers, it has also fundamentally shifted the way that people communicate with each other, transact with businesses, identify tastes and preferences, understand, learn, and exchange information. Combined with the overarching impacts of globalization, the internet has helped to ensure that each individual that is connected is able to freely communicate, notwithstanding some government controls, with each other.

Broadband is an enabling technology that has a significant impact on the economy. Our review has focused on studies which have sort to quantify the following benefits:

- Economic Growth
- Employment
- Productivity
- Welfare
- Investment

In addition to providing benefits to the economy as a whole, broadband also benefits specific groups in the economy. For example:

- Businesses – benefits include productivity gains, reductions in operating costs and increased revenue through greater access to markets
- Households/communities – broadband provides households with increased convenience and choice of recreational and personal services and generates new ways of supporting and connecting communities
- Regional areas – broadband helps regional, rural and remote areas overcome the barriers of distance through making telecommuting more viable, facilitating improved distance education and improving access to markets.

Even in the absence of a framework to assess investments in broadband infrastructure and broadband-related policies, some of the economic impacts of broadband have been quantified in previous studies. Other benefits are derived from economic theory, but have not been measured in formal studies. This means that any estimate of the benefits accruing from broadband infrastructure are underestimated, as they are estimates of partial equilibrium. The final benefits from increased living standards are likely to exceed the benefits outlined in the studies of the economic impact of broadband.

The main benefits that have been measured in previous studies include:

- Economic Growth
- Employment and Wages; and
- Productivity.

These benefits accrue to the economy and are generally easier to measure due to the availability of data at this level of aggregation, which is collected by the government at regular intervals. In contrast, more disaggregated data relating to benefits to businesses/households or regional areas are often not available or not collected at appropriate intervals.

The multiplier impacts of gains at this more disaggregated level are likely to lead to considerable upside to the Australian economy. However, these gains are unlikely to ever be directly attributed to broadband. The compounding impact of these benefits should not be understated.

The resultant changes to the business models across numerous industries and the associated economic benefits have been so fundamental that a world without the internet is difficult to conceive. Broadband generates increased efficiency, productivity and welfare gains, and potentially contributes to job creation and occupational change. But it also gives rise to security and privacy concerns, and protecting users' security is increasingly important as the broadband-enabled Internet becomes part of the economic infrastructure.

Report structure

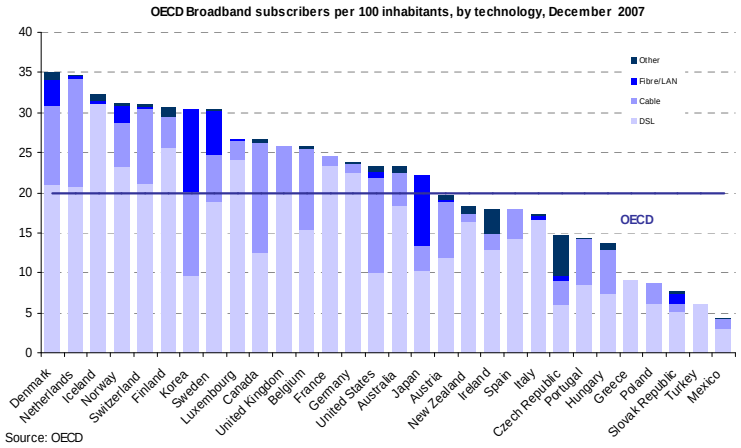
This report has looked at numerous studies of the economic benefits of broadband. Within these studies we have looked at the following key issues:

- Australia's position regarding broadband take up compared to other developed nations
- Australia's proposed investment in a national broadband network compared with investments being made in other nations
- Estimates of the economic impacts, as measured by Gross Domestic Product (GDP), of broadband on the Australian, US, English and Irish economies
- Estimates of the impact on economic growth on employment, wages and productivity gains across Australia, the US and Ireland
- Estimates of the welfare benefits attributable to broadband
- Finally we have looked at the conditions for maximising the benefits of broadband in an economy.

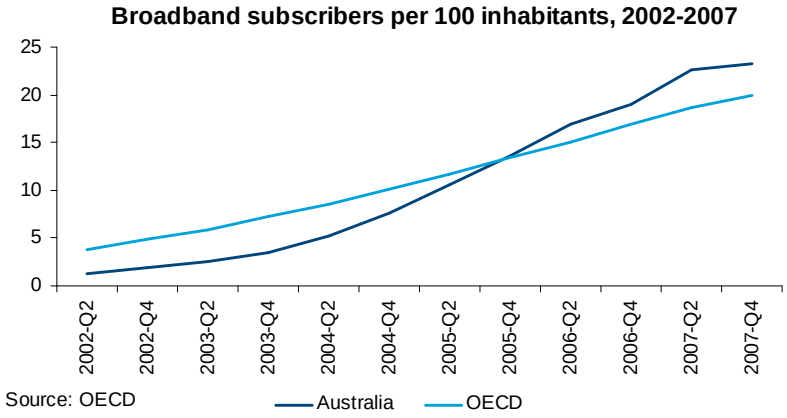
Introduction (continued)

As noted by the OECD, Broadband has become an integral part of almost every aspect of the knowledge economy. For example, traditional telecommunications are increasingly taking place over broadband communications networks, in particular IP networks, rather than circuit switched networks, and people also increasingly use IP telecommunications (e.g. Skype). Public infrastructure increasingly depends on broadband communications networks, from traffic lights control, through control of sewage systems, as well as many forms of transportation, air traffic control, maritime and rail transport and logistics management systems. The government itself increasingly maintains relations online with citizens and firms through the provision of e-government services (e.g. applications for permits, tax authorities, providing information etc.). Military and defence systems are also affected by broadband and the Internet. Global Positioning Systems (GPS) and other navigation systems all rely on this type of information transmission and enable new applications such as the distance monitoring of patients and prisoners. Natural and other disaster prevention and warning systems also heavily rely on the Internet and broadband communication networks.

Changes to computing power, file sharing, file size etc have a massive increase demand on the broadband infrastructure. These are determinants of the access for consumers and business in Australia to markets both locally and internationally, the broader the bandwidth the better Australia is placed to compete with the rest of the world. Competition is being driven by the reduction in both transactions costs and marginal costs for goods and services purchased over the internet, this reduction in costs is having a significant positive impact on consumer surpluses while at the same time reducing the role of the middle man, thereby increasing the available producer surplus.



Source: OECD



Source: OECD

As of December 2007 Australia was ranked 16th out of 33 OECD countries in terms of broadband subscribers per 100 inhabitants, which is above the OECD average. However, this only measures the take-up of entry level 256 Kbps broadband.

Australia is generally considered to be relatively fast at adapting to new technology, evidenced by growth in the uptake of broadband exceeding the OECD average between 2002 and 2007. However, Australia appears to be constrained in terms of its access to an advanced broadband network. In 2007-08, the World Economic Forum ranked Australia 14th in the world in terms of 'Network Readiness' and Australia's relative position has not improved significantly since 2005-06 when it was ranked 15th. At that time, Australia was ranked 25th in terms of available broadband bandwidth and 53rd in terms of the Government's success in promoting Information Communications Technology.

However, Australia's broadband infrastructure already lags behind that of many countries. Investment is required to ensure that this situation does not continue to deteriorate.

Whereas other countries have natural attributes which facilitate the rapid deployment of new network technologies, Australia's vast distance provide a natural barrier. As such those countries which are already ahead of Australia are likely to have considerable investment which would leave Australia further back unless there is considerable investment in broadband infrastructure.

Government Investments in Broadband Infrastructure and Other Broadband-related Policy Interventions in Australia

The Australian Government has committed up to $4.7 billion to fund a National Broadband Network in partnership with the private sector which will be a dedicated downlink transmission speed of at least 12 Megabits per second (Mbps) over each connection provided to premises, using FTTN or FTTP architecture, and that will be available to 98 per cent of Australian homes and businesses. The construction of the NBN has been put out to competitive tender, with an announcement of the successful proponent expected early 2009. The network will:

- be rolled out and made operational progressively over five years using fibre-to-the-node or fibre-to-the-premises technology
- support high quality voice, data and video services including symmetric applications such as high-definition video-conferencing
- earn the Commonwealth a return on its investment (the contribution may take the form of debt or equity and the government expects the successful proponent to make a significant contribution)
- facilitate competition in the telecommunications sector through open access arrangements that allow all service providers access to the network on equivalent terms
- enable uniform and affordable retail prices to consumers, no matter where they live

In addition, there has been significant investments in broadband infrastructure and numerous broadband-related policy interventions at the state level. For example, in Victoria:

Telecommunications Purchasing and Management Strategy (TPAMS) contracts have reduced telecommunications costs to the Victorian government by approximately $200 million over 5 years and resulted in the Government securing approximately $50 million in new telecommunications infrastructure investment for Victoria. In regional areas, TPAMS and aggregated purchasing by Victoria's regional health alliances has led to a commitment of $80 million for new telecommunications infrastructure.

The Broadband Innovation Fund (BIF) supports the innovative use of broadband in delivering public services. Funding of $15 million has been allocated to provide seed funding for projects in strategic areas of government service provision, such as health and education, primary industries and the environment.

VicTrack involves the investment of $21.5million in around 600 kilometres of fibre-optic infrastructure (for rail signalling and safety uses) to the Victorian regional centres of Geelong, Ballarat, Bendigo and Traralgon. The government has made the excess capacity of VicTrack's fibre-optic network and existing rights of way available to support the development of broadband services.

Country	Investment (2007 AUD$)	Network
United States	Investing more than **$5 billion** (SBS Communications) and **$25 billion** (Verizon)	SBS Communications FTTN network will deliver broadband speeds of more than **25 Mbps**, with Verizon's FTTP network delivering speeds of up to **50 Mbps**.
Singapore	**$5 billion**	Open access **100 Mbps** broadband network to every home and business in Singapore
Italy	**$10 billion** (Telecom Italia)	A fibre optic network that will deliver broadband speeds of **100 Mbps** to two thirds of Italians by 2009
Germany	**$5 billion** (Deutsche Telekom)	A national VDSL fibre to the node network providing **50 Mbps** to 50 German cities

The requirement of the NBN to achieve 98 per cent coverage is comparable to Singapore which has a 100 per cent roll out plan, however, the differing concentrations of population suggests that this may be onerous in the Australian context. The United States does not have a mandated target and Germany and Italy have limited their target to 50 cities and two thirds of the population respectively.

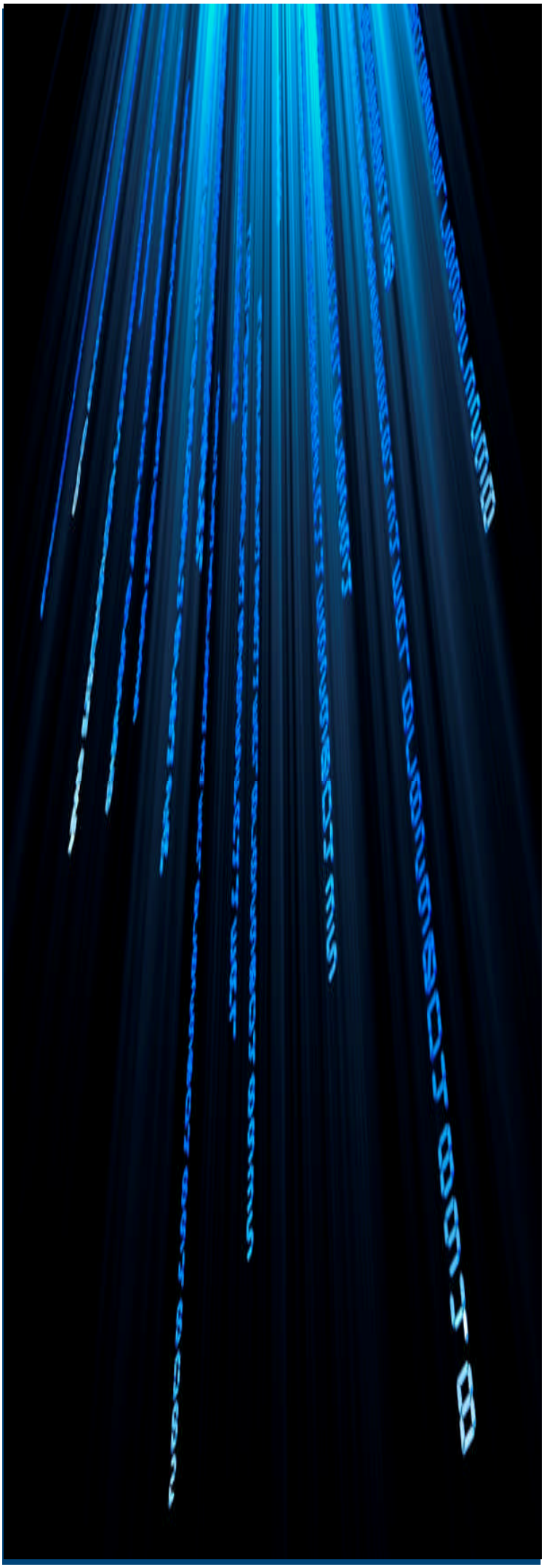
While the NBN represents an important part of broadband investments other technologies, including:

•Copper telephone lines (e.g. ADSL type of connections)

•Wireless systems (e.g. 3G mobile connections)

•Hybrid fibre- coaxial (HFC) cables (as used in the US)

Should all have an important role to play within a competitive infrastructure environment.



Previous estimates of the economic impact of broadband on International Economies

- Australia
- US
- Ireland
- England
- Korea

Australian Studies Measuring Economic Growth

Broadband has become an important part of almost every aspect of the knowledge economy and is especially so in activities that rely on the provision of data and information, particularly in service sectors. Many aspects of producing, delivering, consuming, co-ordination and organisation are now taking place over broadband communications networks. The vast majority of papers that quantify the economic impacts of broadband adoption undertake a comparison of the performance of particular economies with broadband to economies without broadband. These studies have been undertaken at the national, state and regional level.

Benefits to the Australian Economy

Advice provided to the Federal Government by The Broadband Advisory Group (2003) stated that next generation broadband could produce economic benefits of $12 to $20 billion per annum to Australia.

The Allen Consulting Group (2002) examined expected economic outcomes in Australia with fully competitive markets, flexible labour markets and without resistance to change and compared this to a situation where policies addressing a lack of affordable internet access were not successful. They assumed that this would result in the price for commercial broadband Internet use being 25per cent higher than the perfectly competitive situation and forecast the differences under these two scenarios using MONASH model simulations. They found that:

- With uneven access to affordable bandwidth in Australia, annual GDP growth would peak at 2.0per cent ($12 billion), rather than 2.6per cent ($15.6 billion) with widespread broadband internet access, equating to a loss of $3.6 billion in GDP in the peak year as a result of poor access to affordable bandwidth.
- The expansion in output would plateau under both scenarios as the stimulus of productivity gains are offset over time as labour costs rise.

Benefits to State/Regional Economies

A report by ACIL Tasman (2004) quantified the economic importance of broadband internet to the Victorian economy, with a particular focus on productivity, gross state product and employment. They estimated that the average annual contribution of broadband adoption to real gross state product (GSP) growth over the period 2004-2015 was:

- 0.47 per cent per annum under conservative assumptions
- 0.82 per cent per annum under less conservative assumptions which were inclusive of employment effects.

Based on this report, the Department of Infrastructure Victoria (2005) forecast that if 70per cent of Victorians were using broadband by 2015 an additional $15 billion would be added to Victoria's GSP (real).

The Australian Local Government Association 2006-07 State of the Regions report highlighted high speed broadband as a key economic driver in regional communities and estimated that the failure to address inferior internet access quality could cost regions up to $2.7 billion in foregone gross products.

The Allen Consulting Group (2003) also analysed the impact of a "true" broadband network (capable of supporting at a minimum video, voice and data services and applications simultaneously e.g. 10 Mbps) on the Brisbane and Moreton statistical divisions, as well as for Queensland at large.

The analysis factored in a network cost of approximately $850 million over a four year construction period with 50per cent coverage. This included backbone infrastructure costs as well as the hardware, software and installation costs of delivering fibre-to-the-home connectivity.

The findings of the study suggested that the majority of the benefits accrued from:

- increased productivity gains
- expansion of the telecommunications sector (i.e., the businesses providing the true broadband network),
- expansion of digital content industries making a relatively modest contribution.

In relation to economic growth, the report found that over 15 years to 2018-19:

- There will be an increase in output in the region in net present value terms of $2.64 to $3.2 billion
- The local network will also benefit the Queensland Gross State Product (GSP) by $854 million per annum
- Output across industry segments increased manufacturing output by 0.66per cent compared to 0.59per cent for agriculture and mining, 0.43per cent for communication services and between 0.14per cent and 0.39per cent for other industry segments
- In Queensland, annual aggregate consumption would increase by between $499 million and $840 million in 2018-19.

Overseas Studies Measuring Economic Growth

In the US it has been estimated that a "true" broadband network delivering minimum speeds of 10 Mbps could increase US GDP by as much as $500 billion per year for 10 years. Based on Australia's GDP relative to the US in 2007, this is equivalent to Australian benefits of almost $A40 billion per year equivalent to 4 per cent per annum.

United States

The Telecommunications Industry Association (2003) noted that:

- Gartner Dataquest could result in an incremental increase in the U.S. Gross Domestic Product of as much as $US500 billion annually for the next 10 years
- If translated to the Australian market this would be approximately $A40 billion per year in Australia based on the benefit being 3.6per cent of 2007 GDP
- The Gartner Dataquest study supported the earlier work of Robert Crandall and Charles Jackson which estimated the benefit of broadband to the United States to be upwards of $US500 billion per year
- The Corporation for Education Network Initiatives in California (CENIC) in 2003 projected that California's "One Gigabyte or Bust" broadband initiative to make available one gigabit broadband to every education institution business and home by 2010 could result in an estimated $US376 billion growth in GSP by 2010

Ford and Koutsky (2005) found that broadband investment by municipalities has an effect on economic growth. Comparable counties in Florida were used to find that where the broadband network was extensive – effectively 100per cent saturated and accessible to local businesses – there was considerable growth associated with the access.

Ireland

A report by Forfas (1998) assessed the state of development of broadband in Ireland and the potential gains from new infrastructure. They estimated that by 2010 GDP could be 5per cent lower and exports up to 10per cent lower than the potential achievable if the level of telecommunications infrastructure and services in Ireland was not comparable with the best available in competitor nations. The Information Society Commission interpreted this to mean that broadband investment of £200 million (€254 million) along the lines discussed in the report would increase Irish GDP by £4 billion (€5 billion) per annum by 2010 (approximately 2 per cent of GDP).

United Kingdom

The UK Broadband Stakeholders Group estimated that, based on a conservative estimate of 10 million broadband connections in the UK by 2015, GDP could be £22 billion higher than otherwise. The equivalent benefits to Australia of $A19 billion based on the benefit being 1.1per cent of projected GDP in 2015.

However, given that the UK already had approximately 15.6 million broadband connections covering 50per cent of households at the end of 2007, it is likely that the benefits are grossly underestimated. Given the assumed penetration has already occurred and that these benefits are currently occurring the economic benefits which were not expected until 2015 are currently occurring. Bringing forward these benefits will have a positive impact on GDP growth as these benefits and the growth factors compound to result in more jobs and greater benefits.

Korea

Korea is the world leader in terms of broadband investment, however, little work has been undertaken to link this position to the economic growth experienced through the economy over the past few years. For example, Korean GDP has grown at approximately 4 per cent per annum over the past six years, however, there has been no formal study of the contribution broadband has played in this development.

The Korean economy has been able to grow relatively rapidly over the past 40 years through its ability to shift from one industry to the next. That the shift in emphasis throughout the Korean economy from labour intensive industry throughout the 1960s, to heavy industries throughout the 1970s, to processing industries in the 1980s, and throughout the 1990s and 2000s towards more service IT related industries has resulted in significant growth.

At the same time there are some structural issues within the Korean economy which are currently being addressed to ensure that returns on the investment of broadband infrastructure are maximised:

- Improve the number of small and medium sized businesses with computer and internet access from 50 per cent to 100 per cent
- Increase the number of leased line connections
- Increase the amount of e-business undertaken through direct tax incentives
- Targeted programs which focus on ICT skills throughout all levels of the economy (high school through to Chief Information Officers).

Studies Measuring Economic Growth

The question of what is the actual economic benefit from investment in broadband ignores the fundamental issue. That is, in an environment where others are investing and you are not, you are losing competitive advantage – either through the development of an technological breakthrough or through losing access to particular markets. A lack of investment is the equivalent of a game of economic roulette – sooner or later someone will pull the trigger leaving those who do not invest at a significant disadvantage.

Australia's economic position is linked to the growth of its broadband services. Effectively Australia's ability to keep pace with other nations or exceed other nations in respect to broadband deployment, along with the ability for Australian users to adopt the applications which facilitate new technologies, has the potential to significantly impact on Australia's growth trajectory.

In considering the question of what is the likely impact in terms of growth of the Australian economy, our review of the literature suggests that there is a considerable range of outcomes. The variability within this range is conditional on a number of underlying assumptions used by the authors of each individual study. For example, consider the following questions:

- What is Australia's growth trajectory in an environment where it is the only nation able to deploy and take advantage of broadband investment?
- What is the impact if this assumption is reversed and Australia is the only nation which does not undertake such an investment?
- What is the impact if Australia and other nations are able to deploy and take advantage of broadband investments at the same time?
- Finally, what is the appropriate base case to consider against all scenarios, that is what does the world look like when no nation undertakes the necessary broadband investment?

Each question yields a unique growth path and results in economic growth or lack of economic growth. We have to consider each of these scenarios within the context of strategic game theory. Under this framework, the decision to invest in broadband becomes a question which is similar to the Prisoner's Dilemma or the mutually assured destruction (MAD) game of nuclear armament in that it the impact of one player has considerable impacts on the choices of the other players.

Within this framework, if each nation agreed not to use broadband technology the status quo is retained and nations are able to compete on a business as usual basis. However should one nation renege on the agreement and use the technology, they would effectively take advantage of the competitive position that the technology enables. This is done at the expense of the nations which do not undertake any investment.

As this situation is untenable to the nation which does not invest, they are left with no choice but to invest. Once this decision is taken the gains to the first country are limited and the second country achieves growth. This is set out below.

		Country A	
		No deployment or investment in Broadband	Deployment or investment in Broadband
Country B	No deployment/ investment Broadband	Growth in Country A 0, Growth in Country B 0,	Growth in Country A +2, Growth in Country B -1
	Deployment/ investment Broadband	Growth in Country A -1, Growth in Country B +2,	Growth in Country A +1, Growth in Country B +1,

As can be seen above, economic growth is maximised when at least one country undertakes an investment in broadband. However, the relative position of individual countries is impacted by their decision to invest or not to invest.

This result leads to an important consideration in the assessment of the economic gains from broadband investment. Namely that depending on the original starting point and assumptions regarding the final end point in terms of the actions of competitors, the impact on economic growth varies considerably. This is consistent with the various studies we have analysed in that our review of the literature regarding the economic growth trajectory which has been within the following range 0.3 to 3.6 per cent.

This point was recently emphasized by the Korea Information Society Development Institute which stated that as global competition intensifies Korea can no longer expect any great leaps in the growth of key IT products. Rather, in an environment where all countries are investing in broadband infrastructure, specialisation is required in areas where economies have natural advantages over other economies. The Korean example is that it must focus on basic industries such as components and materials while looking for the next growth engines.

Studies Measuring Economic Growth

Further to the scenario developed on the previous page we have considered a hypothetical model of the underlying growth rates for each scenario. In the unlikely environment that Australia is able to fully capture the benefits of broadband the economic growth rate will be higher than it would otherwise have been.

The second scenario is the case that all nations capture benefits from broadband. Therefore, the first scenario – where only Australia invests, yields a result which is too high as the benefits are shared and the projected growth rate is lower.

The third scenario is in the environment where no country is able to take advantage of the broadband investment, growth is relatively constant, and importantly is not incremental, that is there is no advantage to any of the nations.

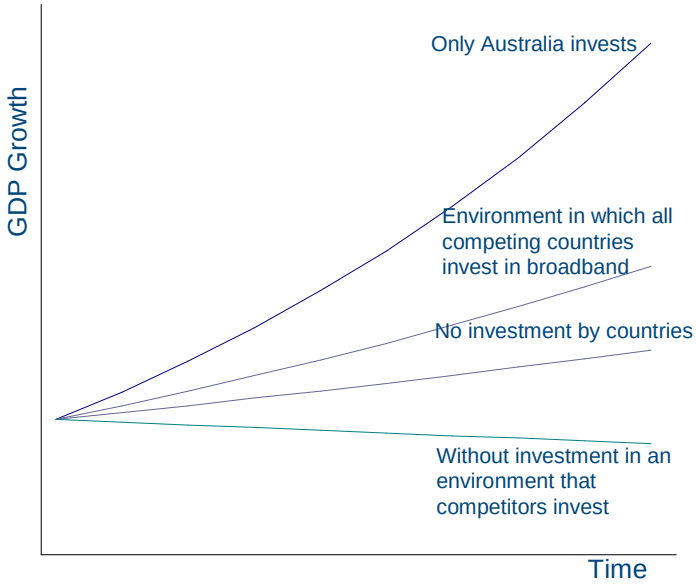
The final scenario is the situation which should be avoided at all costs. With broadband deployments occurring at pace throughout the world, Australia's inability to compete has the potential to negatively impact growth prospects.

Within each of the studies reviewed the high end studies, that is those with a 3 per cent or greater growth rate have typically considered their assessments from the first perspective. That is, their assessment of the contribution to growth has considered this point as the starting position from which economic growth should be measured. Those studies which have lower economic growth rates have typically considered the incremental benefits from the initial starting position. The key differences between the two types of analysis is the treatment of lost opportunities from a lack of investment. Both are consistent in their assessments and their end position, however, differ widely owing to their initial positions.

In addition to these differences, the impact of end users on the economic outcomes is highly influential on the economic benefits which accrue to individual economies. The use of the internet to generate additional economic activity, rather than displacing existing activities, is a key determinate of the success of broadband infrastructure in driving great efficiency within the economy.

As demonstrated, there is considerable uncertainty in providing any assessment of the potential for economic growth from a particular type of investment or the application of a particular type of technology. This is highlighted by the current issues faced by the Australian and global economies. Contractions in levels of global economic growth will make it difficult to assess the impact or success of the broadband at cushioning the Australian economy.

Our review has indicated that there are both real and measurable benefits associated with broadband. However, the lack of direct linkage to broadband and the inability to untangle the impact of information communication technologies more generally, increases the variability of the results of economic studies attempting to measure these benefits.



The upper end of this range suggests that these benefits could be as high as 3 per cent per annum. This estimate appears to be at the upper end of the likely range in that is likely to measure the benefits of a broadband world against the situation where we actually reduce our current broadband capability.

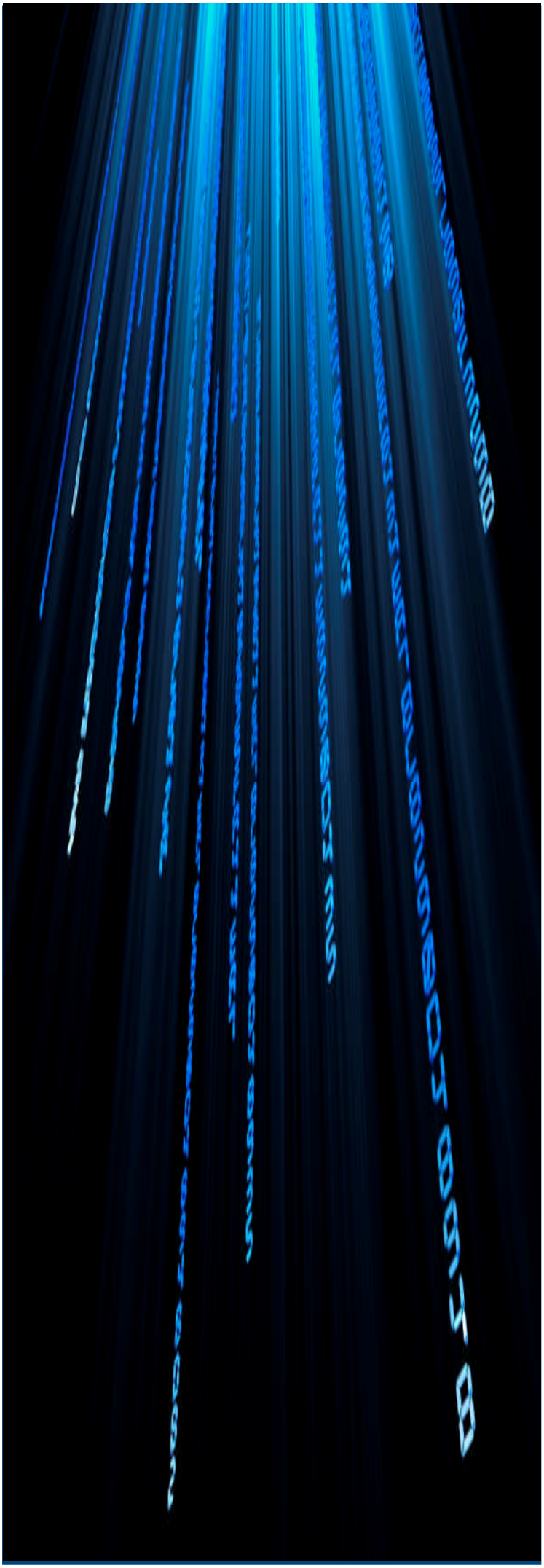
The lower estimates within this range suggest that economic growth attributable to broadband would be as low as 0.3 per cent. However, these estimates have all been made at the state level. A national assessment which looks at the compounding impact of this growth is likely to result in a higher value.

Within the context of the studies examined there is a significant range of economic outcomes possible from the development of broadband across Australia. These results are considered against the conditions discussed above. Furthermore, the sample bias is also considered in the table on the following page.

Consideration of the various estimates of economic growth

Study	Range of economic returns (percentage figure are on a per annum basis)	Notes on the study
Broadband Advisory Group	1.2 to 3 per cent	$12 billion to $30 billion taken from *Broadband for Australia, An Economic Stimulus Package* a paper prepared by Accenture.
The Allen Consulting Group	2 per cent	Based on what it considered was poor access to affordable bandwidth (2.6 per cent if this improved, i.e. broadband is made more available through cheaper prices). Study assumed perfectly competitive markets and fully flexible labour markets. These are real world limitations which ultimately would reduce the economic benefits outlined.
ACIL Tasman Group	0.5 to 0.8 per cent	State based analysis of the rollout broadband as part of the Victorian Government's multimedia Victoria investment. Assumed that investment built on the roll out occurring by companies. Assessment closer to the scenario described where investment is incremental and building on existing infrastructure.
The Local Government Association	$2.7 billion of the GSP of regional Australia	Looked at a 'inferior' internet access costing regional Australia. This impact is unlikely to occur given the Government's announced NBN.
The Allen Consulting Group	0.28 to 0.48 per cent	Assessment based on limited roll out in two major statistical division, does not included a scenario of roll out across the state. Rather the state assessment was based on the benefits which accrued in the two statistical division and the multiplier affect of these benefits across Queensland.
Gartner Dataquest	3.6 per cent	Assumes that GDP there is an incremental growth per capita of $4,000 by 2010. Further assumes that there is 50 per cent penetration by 2010 if regulatory and financing conditions prove favourable. This figure is considered to be high compared to other estimates and reflects the population and market size in the US.
Information Society Commission	2.6 per cent	This report is based on a market failure which the commission believed required government investment. The returns available are based on a low base. While noting this the Commission effectively suggested that Ireland needed to invest to stay relevant in its markets. The 2.6 per cent is a high estimate which could be reduced in the Australian context.

We consider that those estimates at the low end of the range are due to partial treatment of a broadband roll out. That is, either across one state or one limited geographical region (e.g. the Allen Consulting Group's consideration of Queensland). At the same time those at the upper end of the range appear to assume that only one country moves to broadband environment suggesting that this to is too high. As such we have limited the range of economic growth attributable to broadband technology to 1 per cent to 2 per cent per annum.



Previous estimates of the employment, wages, productivity and welfare impacts of broadband on economies

- Australia
- US
- Ireland

Employment

Widespread broadband adoption results in a structural change in the economy towards skilled knowledge-based jobs that are complimented by broadband related technology and away from many blue collar jobs that can be replaced by capital that is also enhanced by broadband related technology. However, the overall affect of this structural change appears to be an expansion in the number of people employed.

The job growth resulting from the deployment of a broadband network is likely to occur from three main sources:

1. Direct labour associated with deploying and maintaining broadband investment

2. Direct labour associated with manufacturing the infrastructure components and customer premise equipment

3. Indirect labour associated with creating services and applications, including supporting industries that would result once the network is deployed.

The direct economic impact of broadband investment will contribute to other sectors of the economy, creating indirect job growth in related sectors, for example in information technologies but not directly related to broadband.

Small and medium enterprises (SME's) are collectively the largest employer in Australia and therefore growth in that sector has direct benefits to the economy through an increase in productivity and in turn employment. Broadband can provide SMEs with opportunities to improve business processes, develop new business models and provide services to new markets both in Australia and internationally. This, however, must be countered with the reduction in staff levels as a result of more efficient less capital intensive processes that can utilise the efficiency of broadband services. Thereby reducing the impact of jobs growth by increasing the productivity across particular sectors of the economy.

Importantly, initial evidence from Korea suggests that this segment of the market can be relatively slow to adopt the new technology and processes which it may enable. As such it is likely that broadband infrastructure should be followed with a targeted project for SME to ensure that the benefits to this sector are realised.

National Economy

In 2002, the Allen Consulting Group examined expected economic outcomes in Australia and predicted that:

- Assuming perfectly competitive markets, employment in Australia increased in the short run (up to 2004-05) by 1.2per cent (around 110,000 jobs)
- The scenario with poor bandwidth only experienced a 0.4per cent increase (about 37,000 jobs)
- therefore, in 2004-05, widespread access to affordable broadband increased employment by 0.8per cent (around 73,000)
- With Government investment in a National Broadband Network, the accessibility of affordable broadband may have a positive impact on the broader economy.

New South Wales

In 2003 Allen Consulting Group estimated that a state wide broadband network in NSW would increase employment by 3,400 jobs after 10 years. Given historic population levels in NSW sourced from the ABS, which reached 3.4 million in June 2008, the additional employment is likely to be around 0.1per cent.

The Allen Consulting Group has suggested that the trade-off involved with an open access network is lower levels of additional employment. However, at the same time if there is open access in an Australian context it has the potential to result in an inefficient duplication of investment which will actually result in an increase in unit cost leading to lower usage and lower economic activity. As such we have discounted this as a major factor in the assessment of the potential outcomes associated with employment growth in the Australian context.

Employment

Queensland

In 2003 the Allens Consulting Group estimated that the economic impacts of an $850 million "true" broadband network in Brisbane and Moreton would be:

If the network is offered by a vertically integrated retail service provider:

- Increased employment in the region by an average of 1,030 per year over 15 years (15,450 additional jobs by 2018-19)
- Average additional employment in Queensland of 1630 (24,450 additional jobs by 2018-19). Based on June 2008 ABS employment estimates, this equates to around a 1 per cent increase.

If the infrastructure was operated as an open access true broadband network

- Average additional employment in the region of 1,005, accounting for 15,075 jobs by 2018-19
- Average additional employment in Queensland of 1586 additional jobs, accounting for 23,790 by 2018-19. Based on June 2008 ABS employment estimates, this equates to around a 1per cent increase

Victoria

In 2004 ACIL Tasman suggest that an average annual growth in the number of persons employed in Victoria over the period 2004-2015 resulting from broadband adoption by 70 per cent of the population by 2015 is 0.5 per cent per annum, creating an additional 153,000 jobs. This is an average of 12,750 per year, which equates to 0.25 per cent of the Victorian population based on June 2008 ABS projections.

Other

The Australian Local Government Association 2006-07 State of the Regions Report estimated that the failure to address inferior internet access quality could cost regions up to 20,000 jobs in 2006.

United States

Based on a cross-sectional analysis of US state-level data between 2003-05, Crandall, Lehr and Litan (2007) estimated that, for every percentage point increase in broadband penetration in a state above its average 2004 level of 12per cent, employment is projected to increase by 0.2 to 0.3 per cent from 2004 to 2005. For the US private non-farm sector, this suggests an increase of about 300,000 jobs, assuming the economy is not already at full employment.

In 2002, the US Department of Commerce quantified the benefits of nationwide broadband deployment for employment, projecting that the expansion of broadband has the potential to provide an increase of 1.2 million U.S jobs. Based on U.S Department of Labor employment statistics for May 2007 (134 million), this equates to a 0.9 per cent increase in employment

In 2003, CENIC estimated that California's 'One Gigabyte or Bust' broadband initiative promises to add 2 million jobs by 2010, increasing employment from a base of 14 million in 2000 to 20 million in 2010 (an additional 11.1 per cent employment in 2010 and an additional 1.1per cent per annum). However, this initiative has not been as successful as originally envisioned. According to US Department of Labour statistics, seasonally adjusted employment in June 2008 was only 15.1 million, which is less than the base case level of 17.1 million expected in 2008

The most recent research conducted by Gillett, Lehr, Osorio and Sirbu in 2006 undertook econometric analysis of the entire U.S comparing zip codes with and without access to broadband. They found that between 1998 and 2002, communities in which mass-market broadband was available by December 1999 experienced more rapid growth in employment, with broadband adding about 1 to 1.4 per cent per annum to the growth rate in employment. However, the analysis did not find a statistically significant relationship with employment at the state level.

Ireland

According to the Information Society Commission (2003) a broadband investment of £200 million (€254 million) in Ireland could result in net employment creation of over 85,000 in the first 10 years of broadband adoption. Using 2008 Ireland employment data sourced from the Central Statistics Office Ireland, an average increase of 8,500 jobs equates to an approximate annual increase of 0.4 per cent.

Wages

As a result of the structural change resulting in a shift towards a more skilled knowledge-based workforce as well as the productivity gains associated with broadband, we might expect real wages to increase. However, increasing capital intensity is likely to put downward pressure on wages in jobs that can be replaced by broadband related technology. This distributional effect, involving both winners and losers means that the overall effect on real wages is uncertain. Some studies have found a positive impact on real wages, while others have found an insignificant relationship.

Australia

The Allen Consulting Group (2002) found that, over 10 years in Australia, the value of the real wages gap between the two scenarios that they examined would have a net present value of around $10,280 per employee

Based on an ACIL Tasman report (2004), the Department of Transport Victoria (2005) predicted that if 70 per cent of Victorians are using broadband by 2015, there would be a 3 per cent increase in the real wages of Victorians

The Allen Consulting Group (2003) estimated that the economic impacts of an $850 million "true" broadband network in Brisbane and Moreton would be a 0.038 per cent rise in real wages if the network is operated by a vertically integrated service provider and 0.037 per cent if the network is open access. Based on May 2008 ABS seasonally adjusted estimates of average total weekly earnings of $890.90, this only amounts to an additional $0.33 to $0.34 per week ($17 to $18 per year).

United States

Gillett, Lehr, Osorio and Sirbu's (2006) econometric analysis of the U.S comparing zip codes with and without access to broadband did not find a statistically significant impact of broadband on the average level of wages and there was no significant relationship with either employment or wages at the state level. However, employment in the communications, construction and transport, and retail and wholesale trade sectors are forecast to see a pronounced dip compared to central case forecasts.

There is little evidence to suggest that there is considerable economic improvement through an increase in wages as a result of broadband infrastructure. This is most likely to be driven by the impact of capital labour substitution and the impacts associated with a more integrated labour market. Capital labour substitution is likely to lead to a pressure on wages as capital has the potential to replace jobs which are considered too expensive. Similarly, the threat of outsourcing and potentially off-shoring is likely to have a negative impact on wages which would offset the gains made by those employees advantaged by broadband.

Productivity

As noted by the OECD, broadband is an enabler of changes. It enables change to the structure and organisation of the economy and restructuring when it is combined with other ICTs, such as computer hardware and software, and complementary factors such as skills and organisational change.

However, it is unlikely that the productivity benefits which accrue as a result of broadband will accrue fully to individual companies. Rather, the economic benefits are likely to accrue to individuals.

The growth of the internet has lead to significant economic advantages which are considered throughout this report. However, some of the benefits are difficult to quantify in that the internet has changed the way that people consume information. Examples of these changes which are not necessarily easily quantifiable include the use of street maps online, the same function is performed by a physical map albeit without the interactivity of plotting the start and end points and receiving directions. Another example is the ability to work from home which has the potential to lead to greater parental flexibility and community engagement. This is best exemplified through the experience of the hypothetical suburban worker commuting to the CBDs of Melbourne, Sydney or Brisbane. Given various distances and traffic congestion issues the commute could amount to 1.5 hours each way. Or an aggregate weekly commute of 15 hours. This commute can be avoided if the worker is able to open a remote desktop through a secure Virtual Private Network (VPN) connection. The benefits which accrue to the individual are considered to be outside the normal productivity benefits which would not necessarily accrue to the business. However, a worker who is able to reduce stress through reduced commuting is likely to lead to a more effective and ultimately more productive employee.

Productivity

The example provided was the avoidance of commuting which is made possible by the VPN which enable staff to work from home. The direct benefit to the employer is difficult to quantify as the worker continues to work a full work day, however, the indirect benefits are easily identifiable. Workers who are able to balance home and professional responsibilities are more likely to be more productive in that they are more able to balance the stress of home and work through the avoidance of a three hour round-trip to work. This leads to two unique and completely different economic consequences:

- Greater social cohesion through that time spent within a local community either with family or other groups
- A more productive worker through lower levels of stress

In addition, there are significant additional benefits which include less emission of greenhouse gases (assuming that the commute is made by single occupant car), reduced congestion, and demand for office space. The realisation of these benefits are dependent on the uptake of broadband users. Further, they require a fundamental rethink of the way employers interact with there employees and vice versa.

Broadband enables productivity increases which are driven by:

- Cost reduction brought about by broadband-related technologies such as e-commerce, VOIP and IT systems
- Time savings from reductions in commuting enabled by technologies such as telecommuting and video-conferencing.

Despite the issues involved in differentiating productivity gains derived from broadband from productivity gains caused by other productivity drivers, the following studies have quantified broadband-related productivity benefits:

- The Department of Infrastructure Victoria (2005) stated that Victorian government productivity is forecast to grow by an average of 0.25 per cent per year between 2005 and 2015 as a result of widespread broadband use.
- There have been studies that have focused on the effect of ICTs on productivity growth, and broadband is one component of ICT. For example:
  - The Productivity Commission (2004) analysed firm level data and found that increased use of ICTs contributed an estimated 1-2 percentage points to Australia's annual multifactor productivity growth over the latter part of the 1990s.
  - NOIE (2003) undertook a series of firm level case studies and found that ICTs contributed up to 1.26 per cent to labour productivity growth.

There have not been any studies undertaken in Australia that seek to estimate the contribution of broadband to productivity across the economy. There is some survey data evidence available regarding the contribution of broadband to productivity:

- A survey of businesses on the cost savings derived from using broadband internet by the Allen Consulting Group (2003) estimated that, on average, businesses experienced savings in costs of around 6.3 per cent from broadband internet compared to 1.5 per cent for dialup and the cost savings would result in a productivity gain of around 0.32 per cent.
- The Telecommunications Industry Association (2003) noted that:
  - A study by the Yankee Group predicted $233 billion in cost savings with universally available broadband in the United States
  - A report by the Momentum Research Group and the Brookings Institution indicated that improved efficiencies in business and government operating expenses in the United States have saved nearly $155 billion already and have the potential to produce $500 billion in savings by 2010.

    Studies have suggested that productivity is likely to be around 1 per cent per annum associated with broadband penetration. In addition, there are likely to be a considerable efficiencies generated and captured by the individual.

Studies Measuring Welfare

Broadband also helps to bring welfare improvements. For example, it enables more flexible work practices, hours and location, which may contribute to easing congestion and pollution challenges faced by large cities. These factors should enhance the welfare of employees over and above any net effects on employment. Broadband also generates further benefits to consumers by reducing search and information costs and giving greater access to information, making price comparisons easier, raising competition and creating downward pressure on prices. It also enables increased customisation of goods and services and improvements in product quality. More generally, broadband changes the role of individuals in production, facilitating user-driven innovation and the development of user-created content. Broadband can also enable small and medium-sized firms to co-operate and compete with larger firms in a wider range of markets and to re-organise and purchase services that were previously not accessible.

Critical success factors to the internet's explosion and likely continued contribution to economic growth remains the participation of users. The movement to user generated content, either through blogs, podcasts, photo albums, recording artist bypassing the traditional record companies to release albums online, social networking sites has been driven by previously passive consumers of entertainment. Increasing broadband speeds further facilitates this movement and helps to unlock previously unavailable returns to an economy. As an example:

Crandall and Jackson (2001) stated that greater broadband availability would increase the fraction of households that use the Internet and thus would create large increases in consumer surplus than can be deducted directly from current estimates of the demand for broadband alone.

Crandall and Jackson state that the eventual consumer benefit for universal diffusion of broadband in the US could be $300 billion or more. However, were broadband to spread to only 50per cent of US households, this estimate would only be about $100 billion per year suggesting that there are some significant returns to scale associated with broadband investment for consumers.

They go on to estimate the potential producer surplus. Benefits to producers include an increase in total sales to consumers of broadband services, computer equipment, general consumer goods and new services that are developed because of widespread diffusion of broadband internet access. Their estimate of the benefits to producers could easily amount to another $100 billion per year if broadband became as ubiquitous as the telephone. However, if it only spread to 50per cent of households, they estimated that producers would ultimately gain less than $50 billion per year.

Information Society Commission (2003) states that if it is assumed that broadband access will reach 90per cent of households in 20 years and available data for willingness to pay are used, then consumer surplus with a discounted present value of €1.3 billion or about 1.2per cent of Irish GNP is estimated. This supported the Crandall and Jackson estimates on a per capita basis.

The Crandall and Jackson estimates are equivalent to 3.5 per cent of US GDP. This suggests that the welfare benefits are at least equal to the benefits available in terms of GDP growth. The ongoing and multiplicative impacts of these benefits will also be considerable and will lead to greater economic benefits.

Conclusion

This section has sought to identify the impact of broadband investment on employment growth, wages, productivity and the welfare benefits which accrue as a result of broadband infrastructure. As with the estimates of economic growth the assessment of the impact on each of these measures is difficult to quantify, largely owing to the impact other technologies have on the gains described.

Most Australian estimates, which predicted additional annual employment of between 0.1 to 0.8 per cent are lower than overseas studies, which predicted between additional employment growth of 0.4 to 1.4 per cent. This has been in the context of close to full employment economy these estimates may differ in an economy which is slowing.

Estimates of approximately 3.5 per cent of GDP have been used to assess the impact of broadband in terms of the potential impact on welfare. In addition, this assessment is driven primarily through the unlocking of consumer surplus, the productivity benefits accruing to individuals through greater flexibility in the work place have been considered.

Our review of wage growth suggests that there is no correlation with broadband and growth in wages. Whilst broadband is thought to enhance growth and thus create employment opportunities, it also facilitates capital-labour substitution, slowing employment growth, at least in the short to medium term. Furthermore, as broadband is likely to affect different industries in different ways it is likely there will be some sectoral and occupational employment changes and, as a result, the net effect on total employment is hard to identify.

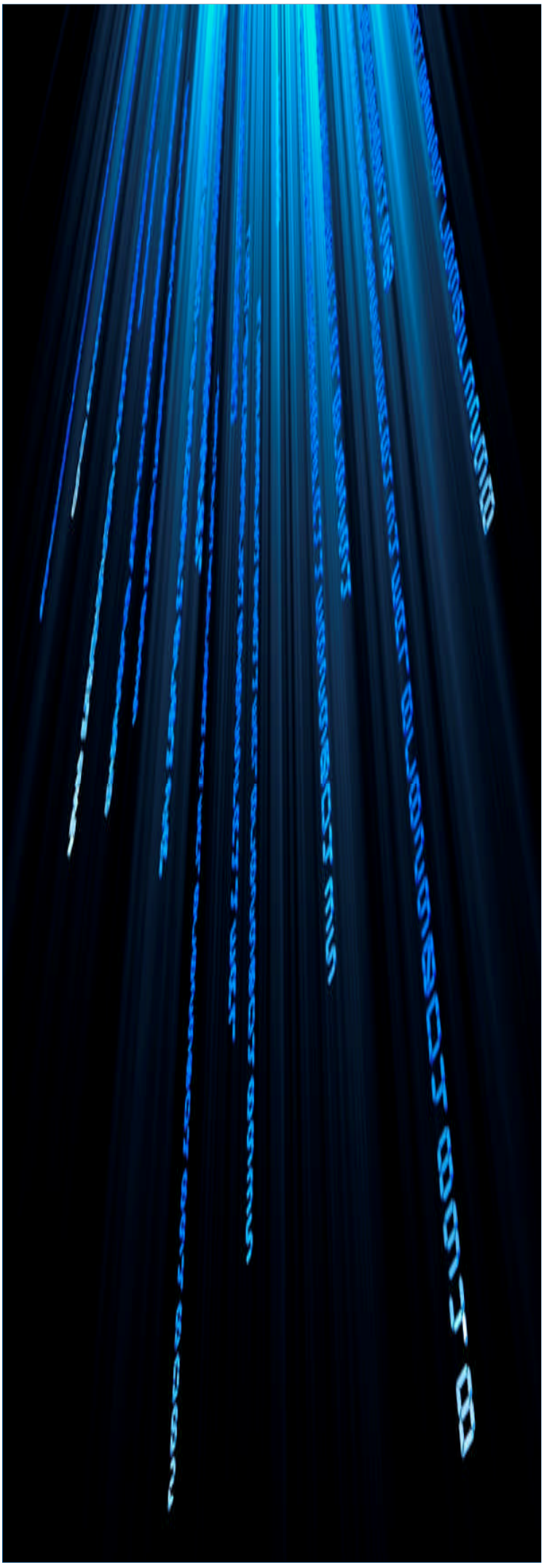
However, there is likely to be significant growth in terms of productivity. Studies have suggested that productivity is likely to be around 1 per cent per annum associated with broadband penetration. In addition, there is likely to be significant gains to employees through the avoidance of real costs such as commute time which may lead to greater social cohesion. The multiplier affects of these gains are likely to exceed those presented in this paper.

The full impact of changes in the workplace and welfare increases is difficult to quantify in absolute terms. Further, one of the biggest impact by far in terms of broadband deployment has been the facilitation of a more connected world. Effectively broadband fuels globalisation which impacts on all aspects across the economy.

As noted by the OECD, automation has historically involved various substitutions in the production process, e.g. animal power for human muscle power, mechanical energy for animal power, machinery for human labour, and most recently, computerisation can act both as a substitute and a complement to human labour. Computerisation and globalisation have similar impacts on employment, which is not very surprising given that ICTs and broadband enable much of the new wave of globalisation.

This globalisation is resulting in the need for economies to become more agile than in previous decades. That is, globalisation and the mobility of workers has lead to a more level playing field in terms access to substitute labour and cheaper prices. This in turn has the potential to significantly increase the returns available to capital owners, and reduce the cost of goods for individuals in the economy. However, this is not with out its costs. For example the structural changes that this drives and the dislocation of affected workers has the potential to have long lasting social impacts. At the same time, if managed correctly, this structural change will lead to a more effective use of capital and greater returns which are then available to share between capital owners and workers. Assuming that it leads to significant improvements, wages and economic growth are likely to grow as a result of the changes.

In addition to these benefits, consumers will pay less for goods and services resulting in a step change in consumption as these consumers are now able to afford of goods deemed to be previously discretionary. That is, the economic benefits of this lower cost environment leads to an increase in the utility of all consumers. As noted this welfare increase is likely to be at least equal to economic benefits discussed in the previous chapter.



Conditions for maximising the benefits of broadband

Conditions for maximising the benefits

At this stage there is a degree of conjecture regarding the conditions which best maximise the benefits of broadband in an economy. The majority of studies have suggested that price is one of the key determinates of the successful adoption of broadband. Other determinates included access and availability of the necessary infrastructure, and the attitudes of users in adapting to the new technologies and opportunities. According to the New Millennium Council (2005), in relation to the accelerated deployment of broadband to the elderly and those with disabilities, it is necessary to lower the price of the service and make broadband more affordable.

To ensure the full social and economic benefits of broadband are realised as quickly as possible, priority needs to be given to encouraging the more effective use of broadband by government departments, service providers, households, businesses and community groups

- Broadband availability – in order to realise productivity gains from broadband adoption, the service must first be available. This is a function of the supply side
- Broadband adoption and take-up curves – a combination of availability and underlying demand will determine whether adoption occurs. The speed with which a sector is likely to adopt broadband is also an important factor in determining productivity impacts over time. This is a function of both the demand and supply side. Adoption is a reflection of the demand for broadband, limited by supply side constraints

According to Australia's National Broadband Strategy (2004):

- A pro-competitive regulatory environment will foster the deployment and take-up of broadband
- Achieving full benefits from broadband requires matching specific needs with available solutions

The New Millennium Research Council (2005) suggested that, in relation to accelerated broadband deployment for seniors and Americans with disabilities, there is a role for the Government, as administrator and sponsor of the Medicare and Medicaid programs, to help educate both patients and health care providers abut the benefits of these technologies. Policies that would accelerate broadband use to benefit seniors and individuals with disabilities could significantly increase the total benefits.

Crandall et al noted that given that the demand for broadband is price elastic, the most effective policies are likely to be those that contribute to lower prices. The surest route to lower prices is provided by increasing competition in the delivery of broadband services.

With respect to the supply side, they suggested that the most important state policies involve incentives to build network capacity. Meanwhile, Federal and State Governments should actively seek to remove barriers to new infrastructure investments by incumbents and new entrants.

At the same time the Telecommunication Industry Association stated that many localities may be concerned about the expense of deploying broadband networks. However, with economic incentives and a favourable regulatory policy, it noted that networks can be built in a cost effective and efficient manner. They noted government's could provide potential fiscal incentives for broadband build-outs, such as tax credits, grants, subsidized or low-interest loans, support for research and development on broadband technologies – particularly for rural and underserved areas – can make broadband network deployment a reality.

Because the demand for technological progress is constantly growing, localities that are planning to install new infrastructure should consider the future needs of their citizens when examining the most appropriate system to install. That is, it is important to build not just for current requirements, but also to exclude a degree of overcapacity in the network.

The majority of these studies have not considered the geographic spread of Australia. This does not necessarily impact on the conditions for maximising the benefits of broadband. However, given the target set by the Australian Government of access to 98 per cent of the population the geographic spread of the country is an important factor in the success of the roll out.

A number of studies have indicated that a key factor to the success of broadband is the reliance on competition. This may not necessarily hold true in the Australian context as it would in other more densely populated markets. The relative market sizes is likely to limit the transfer of the studies to the Australian context.

At the same time, competition from various deployment technologies, for example WiFi versus FTTN, is likely to unlock many of the benefits described in this paper. However, this can only be true in the context of an existing backbone infrastructure roll out and full access to broadband across Australia. That is, it is likely that competition regarding deployment would occur in the major centres where population densities supported the investment case for this roll out, regional centres are unlikely to be serviced. This would support the need for government intervention. While the NBN will ensure coverage, it is dependent on regional populations to take full advantage of the new infrastructure.

Conditions for maximising the benefits

The Korean example

One of the key drivers of the Korean success story has been the ability of the economy to switch between declining sectors towards growing sectors. In addition it has made significant investment in the infrastructure to support broadband services supported by considerable policy measures to ensure a consistent vision and strategy is employed across the economy. Rather than play a role investing in infrastructure, the Korean government has become a roll model for all businesses in adopting broadband application in the delivery of services.

There has also been considerable emphasis on the development of specialised education programs, throughout the economy, to increase the supply of new ICT skills. These programs have also been targeted to ensure that SMEs are not left behind in terms of e-business opportunities.

Where necessary, the Korean Government has made changes to the necessary regulatory and legal framework for broadband to be effective. The majority of these changes have been targeted to fostering the emergence of e-business and the removal of barriers which limit the digital economy.

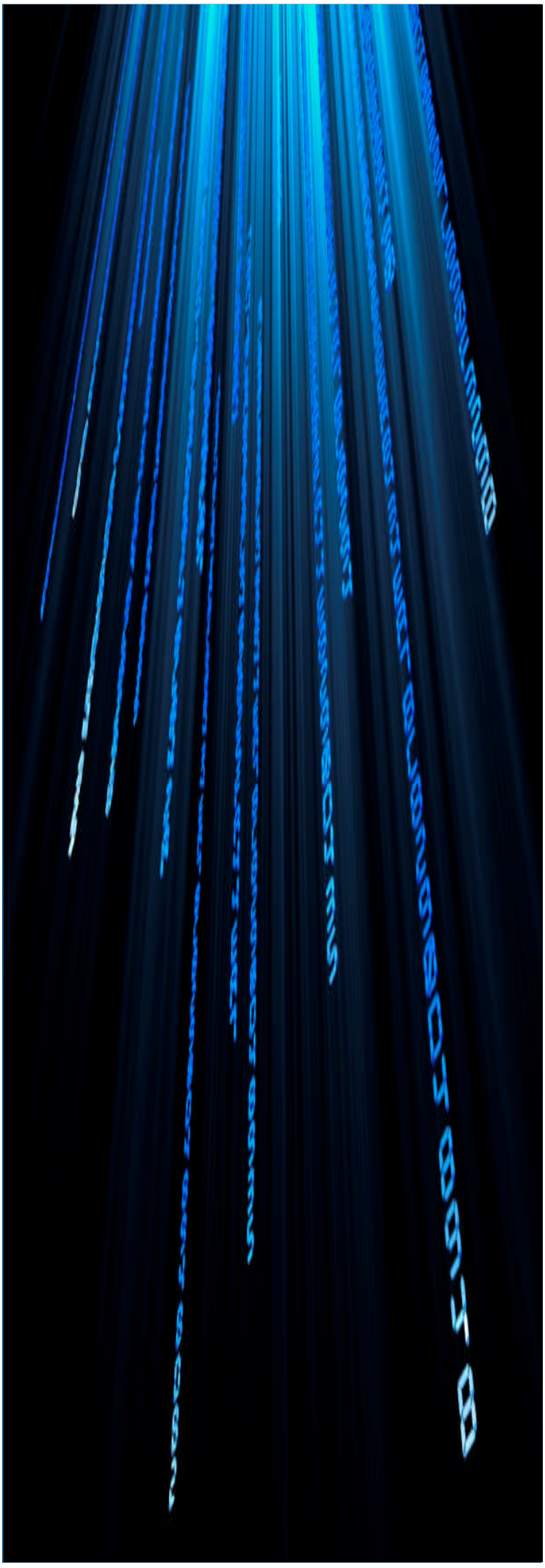
Over the past five years Korea has focused on the emerging gap between large companies and SMEs. Despite this considerable focus the Korean Government continues to note this is a significant weakness in its ability to fully unlock the benefits associated with broadband infrastructure.

Conditions for maximising the economic benefits of broadband

The Australia environment for broadband infrastructure has undergone significant growth over the past five years. Since 2005 the number of broadband subscribers has been higher than the OECD average. However, Australia still lags behind a number of countries in terms of broadband speeds.

The review of the literature has suggested that the next generation of broadband is required to unlock further economic benefits to the Australian economy. That is, speeds of at least 10 Mpbs. Assuming that this situation is addressed and that Australians have access to the necessary speeds to unlock the potential economic benefits of broadband, there are a number of conditions which will need to addressed:

- Australia will need to ensure that combined with the investment in infrastructure there is an investment in skills and training to ensure that all sectors within the economy are able to participate in the economic growth discussed throughout this report.
- There is a regulatory and competitive environment whereby there is the necessary returns on investment to ensure that service providers have the necessary incentive to invest in the infrastructure required to support consumers.
- There is support from government in terms of becoming a key player in the adoption of broadband enabled technologies to deliver services.
- There is a degree of competition between infrastructure providers to ensure that consumers tastes and preferences are appropriately catered to. For example, consumer preference may be for convenience over speed, as such there is a need to ensure that there is the necessary interconnection between the competing technology platforms.



Bibliography

Bibliography

ACIL Tasman 2004, 'Economic Impacts of Broadband Adoption in Victoria', Final Report, Prepared for Multimedia Victoria

Department of Infrastructure Victoria 2005, 'Broadband framework pathway to the future'

OECD 2003, 'Broadband access in OECD countries per 100 inhabitants' (underlying data)

Australian Communications Authority 2003, 'Telecommunications Performance Report, 2002-03'

ACCC 2003, Snap shot of broadband deployment as at 30 September 2003

Department of Communications, Information Technology and the Arts 2007, 'The economic effects of broadband: An Australian perspective', Research Statistics and Technology Branch

Australian Government (2004), 'Australia's National Broadband Strategy'

New Millennium Research Council 2005, 'Great Expectations: Potential Economic Benefits to the Nation from Accelerated Broadband Deployment to Older Americans and Americans with disabilities

Crandall, Lehr and Litan 2007, 'The effects of broadband deployment on output and employment: A cross-sectional analysis of U.S data'

National Office for the Information Economy 2004, 'Australia's National Broadband Strategy'

Ford and Koutsky 2005, 'Broadband and Economic Development: A Municipal Case Study from Florida'

The Telecommunications Industry Association 2003, 'The Economic and Social Benefits of Broadband Deployment'

Crandall and Jackson 2001, 'The $500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access,' Criterion Economics, L.L.C., Washington D.C., July 2001

Yankee Gorup 2001, 'The Collaborative Commerce Value Statement: A $233 billion Cost Savings Opportunity Over Six Years', Module B-to-B Commerce & Applications, Vol. 6, No. 6, Yankee Group, Boston, Mass., June 14, 2001

Joyce 2002, True broadband Can Grow GDP: Gartner', August 27, 2002

CENIC 2003, 'One Gigabyte or Bust Initiative – A broadband initiative for California', Gartner, May 2003

Telecommunications Industry Association 2003, 'The Economic and Social Benefits of Broadband Deployment'

Gillett, Lehr, Osorio and Sirbu 2006, ' Measuring Broadband's Economic Impact', Prepared for the U.S. Department of Commerce, Economic Development Administration, February 2006

The Allen Consulting Group 2002, 'Australia's Information Economy – The Big Picture'

National Office of the Information Economy 2001, 'Advancing with E-commerce'

Cisco 2001, Built for business, report prepared by The Allen Consulting Group

The Allen Consulting Group 2003, 'True Broadband – Exploring the Economic Impacts'

ACCC 2003, 'Snap Shot of Broadband Deployment as at 31 March 2003, ACCC, Canberra

Irish Society Commission 2003, 'Ireland's Broadband Future'

Industry Canada 2003, 'Broadband Connectivity in Canada', CITEL/AHCIET Broadband Seminar, San Salvador, El Salvador, October 2003

Broadband Advisory Group 2003, 'Australia's Broadband Connectivity: The Broadband Advisory Group's Report to Government'

DCITA 2005, 'Estimating Aggregate Productivity Growth for Australia: The Role of Information and Communications Technology'; DCITA 2005, 'ICT and Australian productivity: methodologies and measurement'

United Nations Conference on Trade and Development 2006, ' Information Economy Report'

KPMG 2004, 'Leaders or Laggards, Australia's Broadband Future'

Australian Local Government Association, State of the Regions Report , 2006-07

MIT 2006, Measuring Broadband's Economic Impact'

Gartner Dataquest 2002, 'Telecom Regulation Has Failed: Now What?', 22 August 2002

Momentum Group and Brookings Institution 2002, 'The Net Impact Study', January 2002

US Department of Commerce 2002, 'Understanding Broadband Demand: A review of critical issues'

Bibliography

Broadband Stakeholders Group 2003, 'Broadband Stakeholders Group Report, 2003'

Internet Industry Association 2006, '2010 National Broadband Targets'

Internet Industry Association 2006, '2010 National Broadband Targets'

Citigroup 2006, 'In the Loop', 15 May 2006

Pacific Internet 2006, 'Broadband Barometer'

ATUG/ENGIN 2006, 'Voip Survey', 23 February 2006

OECD 2006, 'OECD Broadband Statistics to June 2006'

World Economic Forum, 'Global Information Technology Report 2005-06'

World Economic Forum, 'Global Information Technology Report 2007-08'

ACCC 2006, Broadband Snapshot', September 2006

McIntyre, P. 2006, 'PBL Boss Calls for Net to be Fixed', Sydney Morning Herald, 23 May 2006

Ricketson, M. "Back Telstra, Packer Urges Canberra", The Age, 15 March 2007

Day, M. and Sproull, R. 2006, "Murdoch Slams Slow Broadband", The Australian, 16 November 2006

SMH 2007, "Fairfax Boss Denounces 'Fraudband', The Sydney Morning Herald, 8 March 2007

Infocom Development Authority, 'Fact Sheet: Next Generation National Infocom Infrastructure", available online from http://www.itu.int/osg/spu/ngn/documents/NGNII-Factsheet-060303-Singapore.pdf

Webster, P. 2007, "Telecom Italia starts roll-out of new fibre optic network this year in Milan", Forbes, 3 September 2007

OECD 2008b. Broadband Growth and Policies in OECD Countries', OECD Ministerial Meeting on the Future of the Internet Economy, Seoul, Korea, 17-18 June 2008

International Monetary Fund 2008, 'World Economic and Financial Surveys – World Economic Outlook Database', October 2008 Edition

Bureau of Economic Analysis 2008, 'Gross Domestic Product by State'

NSW Department of State and Regional Development 2008, Sydney and New South Wales: Fast Facts', 16 September 2008

Department of Broadband, Communications and the Digital Economy 2008, 'Government Invites National Broadband Network Proposals', 11 April 2008

Department of Broadband, Communications and the Digital Economy 2008, 'Request for Proposals to Roll-out and Operate a National Broadband Network for Australia', Request for Proposals Number DCON/08/18, 11 April 2008

Australian Labour Party 2007, 'New Directions for Communications – Building an National Broadband Network'

Forfas 1998, 'Broadband Telecommunications Investment in Ireland'

Broadband Stakeholders Group 2008, 'Broadband Statistics – UK broadband market estimated growth to 2012'

Australian Bureau of Statistics 2008, 'Average Weekly Earnings, Australia, May 2008', ABS Catalogue 6302.0

Australian Bureau of Statistics, 'Australian Historical Population Statistics, 2008', ABS Catalogue 3105.0.65.001

Australian Bureau of Statistics, 'Population Projections, Australia, 2006 to 2101', Catalogue 3222.0

Australian Bureau of Statistics, 'State and Regional Indicators, Victoria, June 2008'

Australian Bureau of Statistics, 'Labour Force, Australia, Spreadsheets, Sep 2008', ABS Catalogue 6202.0.55.001

U.S Department of Labour Bureau of Labour Statistics, 'Occupational Employment Statistics', May 2007

Central Statistics Office of Ireland, 'Principal CSO Statistics – Employment and Unemployment (ILO) 000's'

Productivity Commission 2004, 'ICT Use and Productivity: A synthesis from Studies of Australian Firms', Canberra

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