THE HIGH ROAD OR THE LOW ROAD?

Alternatives for Australia's Future

SUMMARY REPORT

A Report on Australia's Industrial Structure for

AUSTRALIAN BUSINESS FOUNDATION LIMITED

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Contents

Figures and Tables

THE HIGH ROAD OR THE LOW ROAD?

BACKGROUND

This document is a summary of the findings of the inaugural study commissioned by the Australian Business Foundation Limited. It was conducted by Professor Jane Marceau, Pro-Vice Chancellor (Research) at the University of Western Sydney Macarthur, Dr Karen Manley, Visiting Research Fellow at the University of Western Sydney Macarthur and Mr Derek Sicklen, Managing Director of Australian Economic Analysis Pty Limited.

The full report is available from the Australian Business Foundation. The Australian Business Foundation Limited is a recently formed independent economic and industry policy think-tank. It has been established and sponsored by Australian Business Limited, a pre-eminent and long-standing industry association and business services network.

The report is in three parts. The first reviews the key findings of contemporary international economic and innovation-oriented analyses of the characteristics of high growth economies. The second assesses the shape, structure and dynamics of Australian industry as these compare with the characteristics for successful economic development suggested in the literature. Finally, the report indicates the nature of urgently required policy directions.

INTRODUCTION

The OECD suggests that countries now have a choice. They can focus on development based on either:

- competition via investment in technology and innovation - which is important in high knowledge industries and high innovation economies, or
- competition via exchange rates and wages - which is important in industries producing standardised, lower-tech goods and services.

The first route will maximise higher-skilled, higher-paid employment growth and living standards. Given the lack of control over the exchange rate, the second route requires competition based on wages. It is essential to understand that markets themselves won't shift a country from one path to the other.

These conclusions arise from the OECD's recognition that technical progress - the creation of new products or the adoption of more efficient methods of production - is the main source of economic growth and enhanced quality of life. Technological change is, the OECD suggests,

> ...also the engine for job creation as higher wages and profits resulting from technology-induced productivity gains and lower prices lead to increased demand for new products from existing as well as new industries (1997: 4).

Further,

> Competitiveness in high-technology industries is mainly driven by technology factors and much less by wage and exchange rate movements, while the reverse is true in low-technology industries (OECD 1996e: 12).

The OECD has shown that sound macroeconomic conditions, such as the low inflation and reduced public sector debt visible in almost all member countries in the 1990s, are not enough to deal with high levels of unemployment and the need to increase levels of income:

> If economic performance is to improve, additional structural reform, which can *increase innovation and the diffusion of technologies within and among national economies*, seems necessary (OECD 1997: 4 Emphasis added).

PART ONE: ECONOMIC GROWTH IN MODERN WESTERN ECONOMIES

This section summarises the analysis which led the OECD to the above conclusions. It presents major findings from the international economic literature which have emerged over recent years and which focus on the processes of economic development.

THEORETICAL BACKGROUND

Current thinking about the key drivers of economic growth in many modern western economies is dominated by traditional neoclassical economic analysis. The usefulness of that analysis, however, is increasingly in question in the changed economic circumstances prevailing as we move into the twenty-first century. Whilst a few contemporary neoclassical developments provide some insights, innovation-based approaches arising from evolutionary economics are currently, and increasingly, providing the key gains in our understanding of growth processes.

The Neoclassical Approach

Much of the new literature on economic growth notes the inadequacy of traditional neoclassical approaches, whilst acknowledging that within the neoclassical school recent developments in the fields of New Growth Theory and Strategic Trade Theory show some promise. Both of these approaches place knowledge production and distribution at the centre of economic growth and recognise that these forces are internal to the workings of the capitalist economy. They also acknowledge that not all industrial and trade structures are equal in their effects on national

economic performance, that trade and industrial development paths can contain positive and negative feedback loops and that government policy can have important effects in improving these features.

Despite these refinements, these neoclassical approaches tend to be limited in their analysis of economic growth.

The Evolutionary Approach

In contrast to neoclassical approaches, evolutionary approaches focus more on the *dynamics* of economic systems, especially as these relate to innovation and the ways in which technical change occurs. They thus pay more attention to business structures and the conditions surrounding entrepreneurship and innovation. Evolutionary research, or innovation-based research as it is sometimes called, is currently providing a major contribution to our understanding of long-term economic growth.

History

Evolutionary research is based on the early work of Schumpeter. Schumpeter's work was carried out in the early years of the twentieth century, but was subsequently largely neglected by economists and policymakers alike as neoclassical economics increasingly held intellectual sway.

Much intellectual development in any field goes in waves, or dominant paradigms. As the limitations of one branch of analysis become clear so alternative approaches gradually gain visibility and ultimately ascendancy. The work begun by Schumpeter was extended by economists employing innovation-based approaches to evolutionary growth in the UK, Europe and the USA over the 1970s and the 1980s, with the new ideas undergoing considerable empirical examination. From the late 1980s, and especially in the 1990s, the innovation-based approach in its various forms, notably as espoused by analysts such as Freeman, Soete, Lundvall, Nelson and Rosenburg, has received much international attention as a useful means of understanding the processes of change in western industrial economies.

Innovation-based approaches to development and growth are well received by the international business community because they have been supplemented by the work of organisational analysts and innovation specialists working particularly in business schools around the world. The fact that evolutionary ideas were extended within business schools and elsewhere in a context of concrete application to specific industrial problems, has meant that innovation-based approaches have taken more account of the real operations of business than have most other economic theories, notably the neoclassical. Their use can therefore be expected to lead to better analyses of the challenges facing the business world and to more appropriate and effective business development strategies.

Features

The innovation-based approach to economic development views innovation as endogenous to modern economic systems, not constituting an exogenous 'shock' as earlier neoclassical economists suggested. The innovation-based approach treats the economy as an evolving system in which development is contingent upon:

- the innovative activities of firms;
- the opportunities provided in the broader environment which will constrain or enhance the ability of a particular innovation to take root and thrive - these opportunities relate to patent regimes, regulations, market structures etc, and the abilities of firms themselves to absorb new ideas; and
- previous development paths which create reinforcement mechanisms, or 'feedback loops', which can accelerate or retard the innovation process by impacting on the opportunities available.

The evolutionary/innovation-based approach further suggests that some forms of technological change - particularly in an environment of trade liberalisation - have such great transformative power that their spread alters all the rules of the competitive game and hence the dynamics of capitalist economies.

The rapid technological growth and adoption of microelectronics, biotechnology and new industrial materials has resulted in a major transformation of economic systems, commonly referred to as a 'techno-industrial paradigm shift'. This shift increases dramatically the need for economies to be based on innovation and learning in order to be competitive and grow.

THE NEW ECONOMY

The importance of the new economic conditions and innovation-based research has been recognised by the OECD which, in the early 1990s, started a special program of analysis to strengthen the empirical base of the theoretical propositions put forward by the innovation-based school. This program focuses on *national systems of innovation* as part of *knowledge-based* or *learning economies*.

Learning Economies

The characteristics of an effective learning economy have been summarised recently in OECD and other research. A learning economy is:

- ***knowledge-intensive***, suggesting that the amount of R&D carried out is large and its commercialisation is rapid;
- characterised by fast and effective ***diffusion*** of information, both codified and tacit;

- ***innovative***, allowing for the best utilisation of existing knowledge by combining it in new ways;
- characterised by a broad range of well-functioning institutional arrangements interlinked into networks, such networks include firms, research institutions, educational institutions, government as customer and regulator and others;
- ***flexible and adaptive***;
- concerned less with cost than with generating ***new market opportunities***;
- reliant on high levels of ***trust*** for the effective operation of cooperative linkages between economic players;
- concerned with high levels of ***education, skill and training*** at all levels (national, industry, firm) so as to generate, spread and absorb new and existing knowledge and transform it quickly into new products and processes;
- one where innovative firms seek linkages with other economic players in order to access ***complementary assets*** (which help an innovator effectively commercialise new products and services) such as:
  - extensive marketing & distribution channels;
  - state-of-the-art manufacturing facilities;
  - skilled, well-trained management and staff; and
  - customer service capability;
- one where competition AND ***cooperation*** are important;
- one with an ***industry and trade structure*** that enhances innovation and learning opportunities.

Learning Firms

A learning economy is made up of *learning firms.*

Learning firms have the kinds of internal structures, decision-making practices and training programs which constantly update and upgrade the information at the company's disposal. The internal structures, including arrangements for R&D, human resource management programs, and customer feedback procedures, are carefully designed to ensure the efficient utilisation of *information* as a resource and as a major mechanism for the maximisation of other, more traditionally recognised resources such as capital and labour.

As Arnold and Guy have recently explained it,

> In contrast with the neoclassical view of the firm as a simple economic robot, modern evolutionary economics now sees it as a searching, learning mechanism. It survives and improves by continually reinventing itself. It consists of a pool of assets, including both physical assets and intangible ones such as capabilities, and intelligence, which learns from the environment and modifies the resources. (1997: 3)

Some learning firms employ scientists and technical personnel to enhance their learning capability.

The need to learn from the environment, maximising the intelligence available, is so strong and the rewards from doing so tangible that many learning firms recognise that *proximity* matters. They maximise their investment in knowledge/information generation and exchange through co-location into clusters (sometimes referred to as 'innovative milieux') where collaboration and competition act as constant spurs to further innovation.

Networking

Networking activity (cooperative relationships between firms and others) plays a particularly crucial role in the operation of learning economies. Robust linkages between firms are needed for the:

- development of 'know-who' which is critical to the circulation of existing knowledge, especially tacit knowledge, and for the development of new knowledge;
- development of links between users and producers which enable innovation to be sure of a market, especially in industrial products;
- rapid interaction and acceptance of new productive organisational structures and managerial technologies which can improve profitability and efficiency;
- sharing of the risks and costs associated with R&D and innovation;
- fast learning by firms of the different aspects of what is needed for a particular *incremental* innovation, the most common kind in all areas.

The most important sources of ideas and knowledge for innovating firms are their clients and customers, on the one hand, and their suppliers, on the other. Even their competitors are important.

National Innovation Systems

The OECD uses the concept of 'national innovation systems' as a means of ordering investigation into the operation of learning economies. An effective learning economy is characterised by a well-functioning national innovation system. Some countries have more effective national innovation systems than others.

A national innovation system is constituted by a country's firms, its innovation-related institutions and the inter-relationships which come into play between these participants in producing, distributing and applying various kinds of knowledge.

Innovation-related institutions include relevant areas of government and associated public

policies; public sector bodies such as universities and other science-intensive institutions; the education and training system; the financial system; and property-rights institutions. These institutions shape the innovation performance of firms.

The participants in the national innovation system are not seen as behaving randomly, rather they are considered inter-dependent elements of a *system* of innovation. The systemic focus of the national innovation system concept results in the opportunity for more effective empirical testing of the innovative capacity of countries than isolated examination of any one of the traditional indicators of technological performance, such as the number of scientific and technical personnel employed, the funds invested in R&D or the number of patent applications. While these indicators reveal the content and direction of technological progress, they do not, of themselves, explain what it is that enables some nations to obtain higher levels of innovation than others.

The new emphasis on national innovation systems recognises that innovation outcomes depend on the ways in which nations put the different elements of their innovation capability together.

The OECD is presently engaged in a multi-country effort to better understand the dimensions and functions of different institutional arrangements as they relate to innovative and learning success. Although Australia has had some involvement with this task, including reporting on its own national innovation system, the policy section of this report points to the necessity for a more comprehensive effort to map Australia's system. The empirical part of this report gives the reader a broad overview, whist further research remains necessary.

THE IMPORTANCE OF INDUSTRIAL AND TRADE STRUCTURES

The success of a nation's innovation system and its ability to operate well as a learning economy are reliant on its industrial and trade structure. These economic structures both influence innovation and learning performance and are influenced by it. The configuration of a country's industries and trading relations will influence:

- the possibilities for the generation of diversity and the opportunity to re-invent products and processes;
- the opportunities available for local firms to access different kinds of knowledge;
- the number and type of leading-edge customers (who drive innovation forward);
- the presence of related and supporting industries needed to tailor new products to user needs;
- the availability of 'complementary assets' (such as effective management skills, advanced manufacturing equipment, appropriate distribution channels and adequate finance), which are needed to bring R&D successfully to the customer.

In sum, a *diversified industrial and trade structure* is needed.

Most particularly, then, an economy can no longer be indifferent as to the make-up of its industries and trading relations. Computer chips and wood chips do NOT carry the same economic benefits. As the OECD has said,

> ... the sectors that invested more in research and performed more innovative activity are those that employed a larger share of higher skilled workers at the beginning of the 1980s and that continued to acquire human capital during the decade. Increased up-skilling is thus not merely a consequence of some labour-biased technological shock. Sectoral human capital formation and innovative effort can be read as a mutually reinforcing and cumulative process which can have a lasting effect on industrial performance (OECD 1996d: 99).

Industry structure matters at three levels:

- *National*. Knowledge intensive industries pay better wages, train more and contribute more to further knowledge generation and diffusion. They can withstand import penetration better because they are more innovative. The mix of industries affects innovative capability.
- *Industry*. Clustered activities encourage more innovation, including more R&D and networking. Fragmented industries - lots of small price-taking competitors - fare poorly in trade liberalisation.
- *Firm*. Intra-firm learning is vital, and requires high-quality management, constant training and re-training, and inclusive management practices.

SUMMARY OF THE MAIN POINTS FROM THE LITERATURE

The key points to emerge from the new literature are:

- high levels of knowledge, innovation and learning are essential to economic and industrial growth;

- a country's long run competitive advantage will be in those areas where its rates of learning are higher than those of other countries – at national, industry and firm level;

- technological activities are statistically significant determinants of export and productivity performance;

- entire industries and regions can be depressed or invigorated by technological change; and

- within factories the use of advanced technology is unequivocally associated with greater productivity, higher survival rates, higher wages and more rapid employment growth.

PART TWO: AUSTRALIA IN A HIGH-TECH WORLD

This section of the report highlights a number of features of the Australian economy in relation to its capacity for innovation and learning. The data show that Australia has a number of strengths. They also show in particular, however, that the economy has some crucial weaknesses which will impact on the capacity of Australia to provide the growing number of well-paid jobs needed in the context of international movements towards a knowledge-based, innovation-intensive economy.

The Australian economy may be evolving in ways which favour job growth biased towards lower wages, lower productivity, less training and less innovation. This trend undermines our ability to operate successfully as a learning economy.

AUSTRALIA'S INDUSTRIAL COMPOSITION AND LINKAGES

The industrial structure of an economy can significantly influence knowledge generation and diffusion and thus the growth of productivity and of well-paid, skilled employment.

Australia's industrial structure reveals a predominance of low tech industries compared to typical OECD profiles. Australia lacks more knowledge intensive, more innovative industries - the industries which both the theory and the data suggest are the fastest growing areas of world trade and carrying the greatest productivity and employment benefits. This is precisely the opposite industry structure to that regarded as advantageous by the literature.

This lower-tech, lower innovation industrial structure tends to react to international competitive pressures using wages and exchange rates rather than by improving the knowledge intensity of the industrial structure.

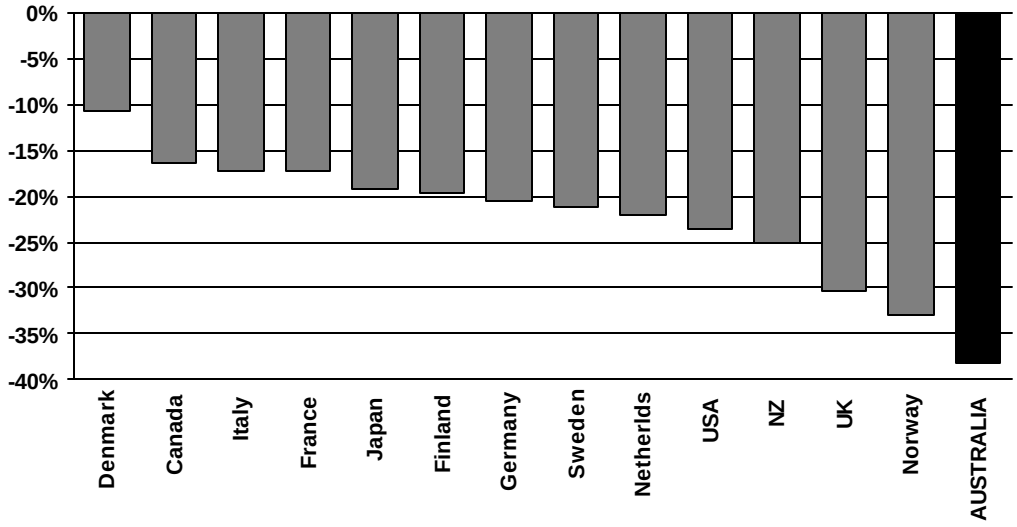
The Role of Manufacturing

The international literature shows clearly that a strong manufacturing sector is important.

Manufacturing is the sector which, in the OECD countries, is the most innovative. The OECD countries growing fastest are those with strong manufacturing sectors.

Like all OECD countries, the Australian economy has seen consistent reduction of manufacturing as a proportion of GDP and the growth of services over the last three decades. However, Australia's manufacturing sector has contracted faster than other OECD economies, as shown in Figure 1.

Figure 1
Percentage Change in Manufacturing Share of GDP, Various OECD Countries, 1970-90



Source: OECD 1994a

Also, Australian manufacturing is not gaining employment in industries with higher R&D intensities. This contrasts with broad OECD trends which favour more knowledge-intensive sectors.

The structure of Australian manufacturing is dominated by low-R&D intensive food and metals industries. This pushes downwards our national level of R&D and innovation.

Industry Concentration

Australian industry is concentrated in the hands of a few large players in many sectors. The largest four enterprise groups[1] account for more than 15 per cent of all industry employment in six major industries. A mere 0.4 per cent of businesses employ over 35 per cent of all business sector workers. This high level of industry concentration has some advantages but also involves many problems that may require policy attention.

On the positive side:

- large firms pay higher wages, engage in more training and are responsible for an increasing proportion of business capital investment; and

- the industrial concentration evident in Australia is part of a global process, as large transnationals merge to gain economies of scale and scope as well as market share.

[1] The 'enterprise group' is defined by the ABS as 'a unit covering all the operations in Australia of one or more legal entities under common ownership/control. It covers all the operations in Australia of legal entities which are related in terms of the current Corporations Law. These may be legal entities such as trusts and partnerships as well as companies. Majority ownership is not required for control to be exercised'.

On the negative side:

- Australia's industrial concentration can increase the vulnerability of the economy because the growing importance of large firms means that in some industries the loss of just a few companies can mean the effective loss of the industry or much of its activity with associated negative flow-on effects;

- the increase in industrial concentration also means that the position of small and medium-sized enterprises (SMEs) vis-a-vis large firms is likely to deteriorate in the absence of greater networking and use of cooperative arrangements (between firms, governments, educational institutions), and that wages, profits, investment and working conditions in SMEs are likely to come under increasing pressure.

Further, the international trend towards increased industrial agglomeration means that the firms against which Australian companies are very large, implying a critical imbalance in the power relationships most Australian firms will face in the world market.

Cooperation and Networking

Strong business cooperation promotes opportunities for learning and innovation. A recent survey of Australian firms and their cooperative arrangements reveals the scope for better performance. Although up to two-thirds of Australian firms engage in some form of cooperative business arrangement, only one-third have more than one networking partner.

Firms in higher technology sectors are more likely to form cooperative arrangements than firms in lower technology sectors. The propensity to cooperate also rises with firm size and export propensity and higher tech firms are more likely to have overseas linkages.

The following benefits of cooperation were recorded during the survey: increased sales, improved market knowledge, new suppliers, new customers and higher productivity. Almost three-quarters of firms achieved higher sales as a result of their cooperative arrangements and over half reported increased profits. Productivity benefits accrued more to higher technology firms than to lower technology ones and to larger firms rather than smaller. The most positive impacts on exports and technology occurred when arrangements were with overseas partners.

The main impediment to the formation of these cooperative arrangements has been management's perception of the likely time involved with them.

The benefits from cooperation were higher when government or industry-association assistance was involved.

Industrial Structure and Input-Output Data

It is also possible to measure the strength of relationships between suppliers and their customers (which are important for successful innovation), using input-output data. In this context it is disappointing to note that Australia's industrial structure appears to be 'hollowing out', at least as measured by the density of input-output linkages over time. One measure of this puts the contraction at slightly over 10 per cent between 1975 and 1989. This is higher than for a similar small sample of resource-based advanced economies.

As well, there seems little evidence of any sustained increase in value adding to Australia's natural resources, and some of the higher knowledge manufacturing industries are seeing a weakening in activity. The density of transactions *within* industries is also declining - by more than for the economy as a whole - and this adds to the picture of a declining potential for firms to form the linkages seen as necessary to a learning, innovative economy.

HUMAN CAPITAL: SKILLS, WAGES AND EMPLOYMENT

A learning economy both requires and produces high-quality human resources. It requires them because its firms are constantly required to innovate, adapt and develop and apply new knowledge. It produces them as a result of all of these activities and also because its educational and training institutions link closely with firms to match the latter's needs. There are thus both supply and demand factors at work.

Management Skills

In Australia, the general incidence of tertiary education is quite high by world standards but this does not seem to be the case with the broad group of Australian managers. The proportion of Australian managers with degrees is less than half that of many other advanced countries where the general standard of education among the population is similar. This appears to continue to be the case despite the fact that the proportion of managers and administrators with degrees has been increasing in Australia over the past decade. The proportion is still barely 19 per cent, less than one-fifth of the entire management and administrative population.

Larger firms tend to have a higher proportion of well-educated managers than do smaller ones but the overall picture is poor. By this measure of managerial ability to successfully innovate, adapt and compete, Australia is not doing well.

Moreover, international surveys of management quality consistently rate the general standard of Australian management as 'poor' on most criteria.

Scientists and Engineers

Australia has shown substantial growth in the business employment of scientists and engineers as a combined group. However, data pertaining to engineers as a separate group reveals a flat trend. In simple terms, this suggests good scope for idea generation (the science function) and poor scope for domestic commercialisation of R&D (the engineering function).

Despite rapid growth of Australian patenting abroad, especially since 1983 when the 150 per cent R&D tax concession was announced, there is widespread evidence that many of these patents are not commercialised by Australian firms.

This suggests a substantial gap between research, on the one hand, and development and commercialisation, on the other. This may be because we do not have the production and marketing skills and scale needed for successful innovation. The skills to harness market knowledge, to form cooperative linkages (to improve scale economies) and to organise good distribution channels matter at least as much as R&D. In this respect, lack of growth in employment of engineers is of concern.

Training

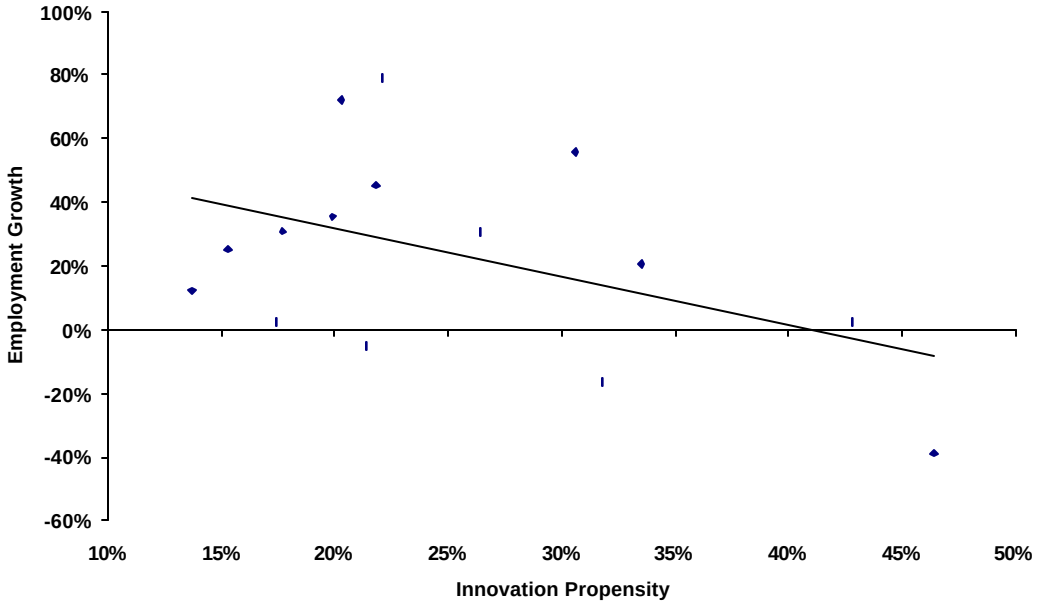
Although the commitment of smaller Australian firms to training rose with the introduction of the Training Guarantee Levy, it has since fallen below previous levels with the abolition of the levy. Australian firms' total commitment to training is only 4.9 hours per employee and declining. In some industries (eg Tourism) it is only 2.4 hours. This, in part, reflects the fact that smaller firms undertake less training than larger firms.

Employment and Wages Trends

Employment growth reveals some disturbing trends. Employment seems to be:

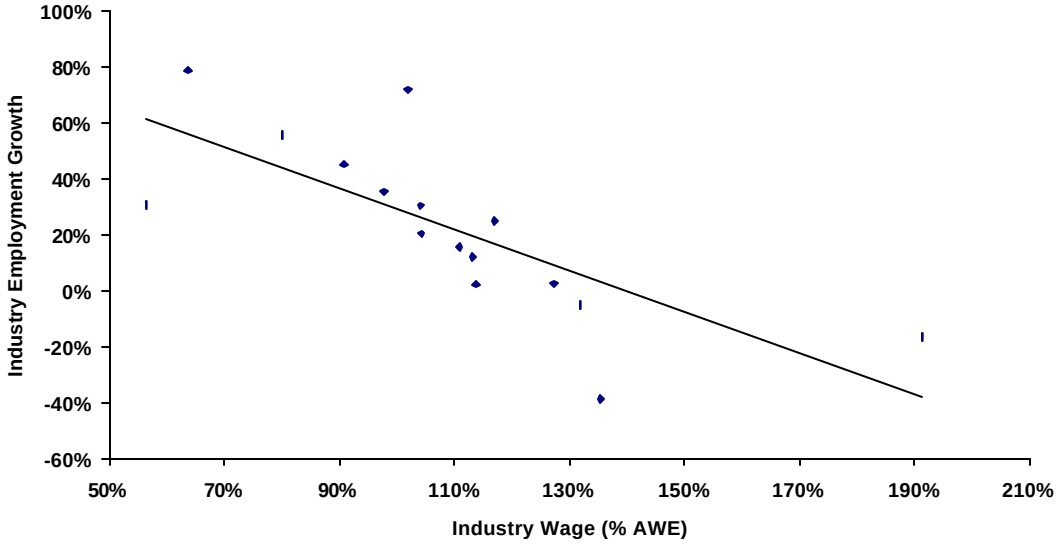
- increasing faster in industries with lower innovation propensities than in industries with higher innovation propensities (Figure 2);
- increasing faster in industries where wage rates have in general been the lowest than in industries where wages have been higher (Figure 3);
- increasing in low-training industries faster than in high-training industries (Figure 4); and
- increasing in low-productivity industries faster than in high-productivity industries (Figure 5).

Figure 2
Industry Employment Growth 1985-95 v. Industry Innovation Propensity



Source: Derived from ABS Labour Force; ABS 8116.0, 8118.0

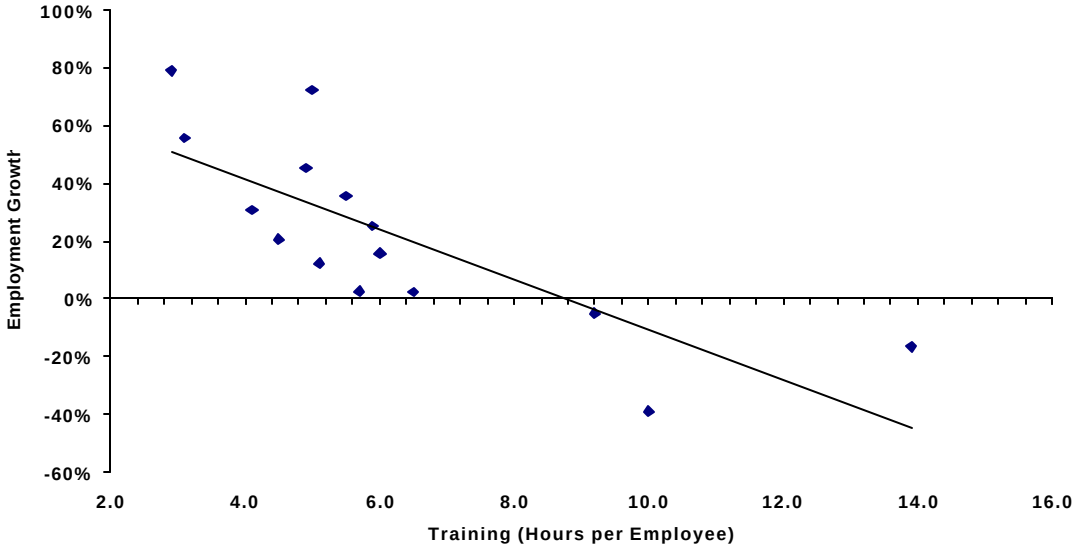
Figure 3
Industry Employment Growth 1985-95 v. Industry Wage Rate



AWE = Average Weekly earnings

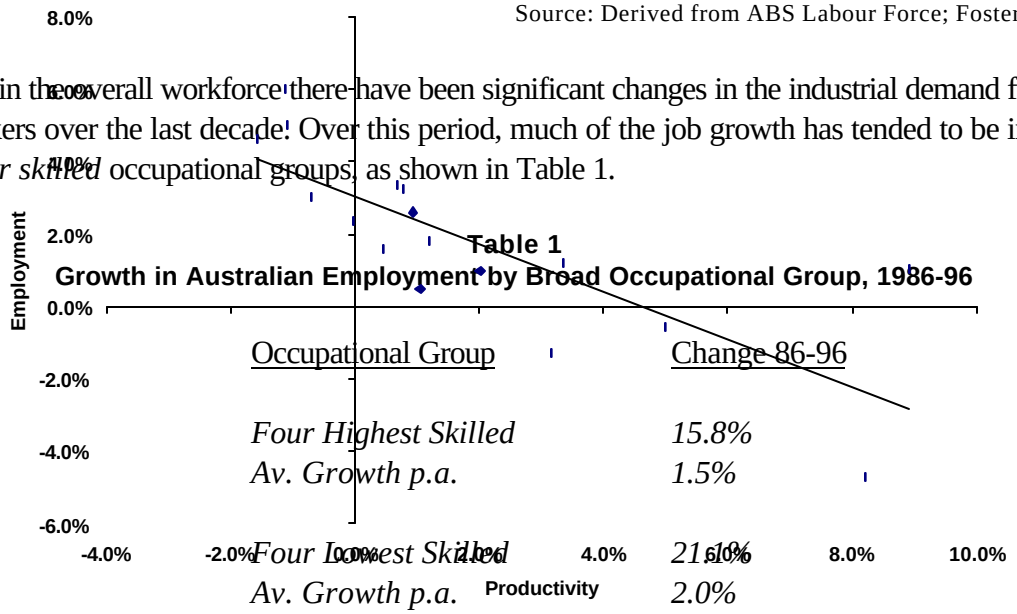
Source: Derived from ABS Labour Force; ABS 6302.0

Figure 4
Industry Employment Growth 1985-95 v. Industry Training Commitment



Source: Derived from ABS Labour Force; ABS ?

Figure 5
Industry Employment Growth 1985-95 v. Industry Productivity



Source: Derived from ABS Labour Force; Foster 1996

Within the overall workforce there have been significant changes in the industrial demand for workers over the last decade. Over this period, much of the job growth has tended to be in the *lower skilled* occupational groups, as shown in Table 1.

Table 1
Growth in Australian Employment by Broad Occupational Group, 1986-96

Occupational Group	Change 86-96
Four Highest Skilled	*15.8%*
Av. Growth p.a.	*1.5%*
Four Lowest Skilled	*21.0%*
Av. Growth p.a.	*2.0%*

Source: Derived from Foster 1996; ABS Labour Force

Further, job growth has been concentrated in *lower wage industries*, with higher wage industries displaying slow job growth or, in some cases, job loss. Also, the industries which have been the greatest employers, in terms of growth, have been those with lower levels of productivity and also a lower propensity to innovate and to train their staff.

Australia's trends in employment appear to be somewhat different to those in a number of

advanced countries, where higher rather than low-tech employment is growing.

These data suggest that Australia risks heading towards - or may be already on - a low wage, low skill development trajectory. If this is the case, as the research discussed in Part One suggests, this path can become self-reinforcing and push us into a downward spiral in terms of our standard of living.

AUSTRALIAN INDUSTRY INNOVATION

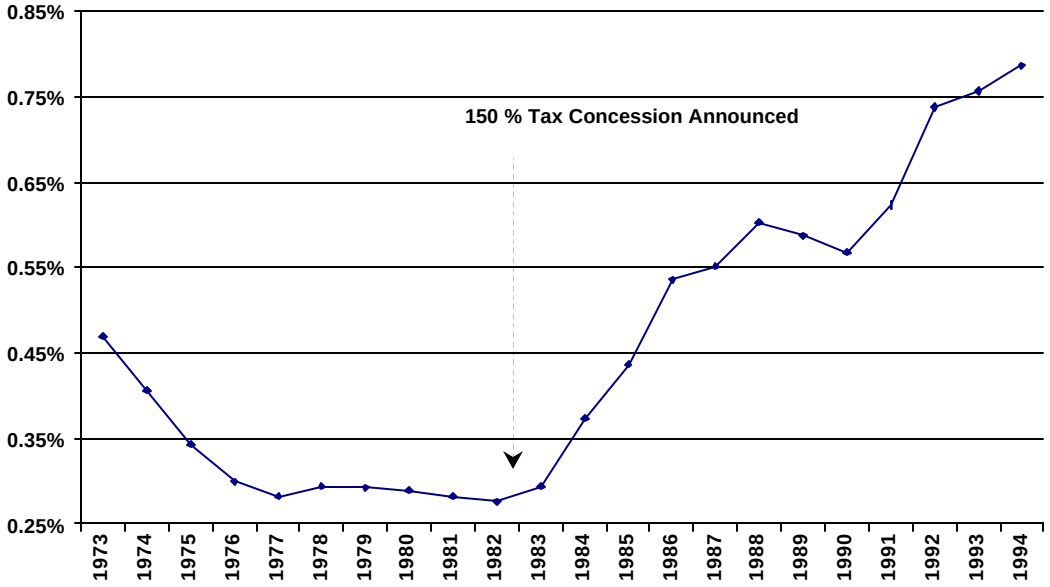
Innovation is the concept central to the new economic literature. It is a key driver of economic and employment growth, being intimately associated with the generation, use and transmission of economic knowledge. As it is difficult to measure innovation activity directly, this section focuses mainly on R&D expenditure.

R&D Expenditure

Research and development has many of the spillover benefits associated with both the new growth theory literature as well as the new learning economy research.

Australian business R&D expenditure is below OECD averages, although it has grown faster than in the OECD countries since the introduction of the 150 per cent tax concession was announced in 1983. Until the introduction of the concession, Australian manufacturing R&D was in decline, with total business R&D (as a percentage of GDP) having fallen by nearly 50 per cent in a decade, as shown in Figure 6.

Figure 6
Australian Business R&D as % GDP



Source: Derived from OECD ANBERD database; DIST 1996; ABS 5206.0

The manufacturing sector accounts for over half of all business R&D expenditure, despite accounting for only 14 per cent of national economic output. Services - especially communications - have shown the fastest growth rate, and Australia's services sector R&D intensity ranks as the highest in the OECD. Most R&D has been conducted in the medium-low and low-tech sectors of manufacturing - reflecting Australia's concentration in these industries - and in some services areas such as computer software. Australia's R&D performance in medium-high tech industries, such as automotive, remains poor by world standards.

Government Programs and R&D

Nevertheless, government programs have had a positive impact, as reflected in Figure 6. Further, in many industries where R&D has grown rapidly, industry programs or government procurement have had significant positive effects. This happened in electronics through the Partnerships for Development program and in shipbuilding via defence procurement.

Industrial Structure and R&D

The following aspects of our industrial structure put downward pressure on our R&D performance:

- the Australian economy has too many low-tech industries;
- in higher technology industries, the small size of most firms in Australia prevents the take-up of high-risk, science-based projects;
- the predominance of overseas-based multinationals reduces R&D activity in many sectors since multinationals still tend to undertake much of their core R&D at 'home'.

Further, Australian corporate R&D expenditure is very highly concentrated, with just two corporations accounting for 12 per cent of the total and the top 10 firms accounting for nearly 30 per cent. This suggests a degree of national vulnerability, in this important area of innovation, to the decisions of a tiny number of firms.

Other Innovation Measures

Other (non-R&D) measures of innovation are used in surveys conducted by the Australian Bureau of Statistics. One measure, product and process change, ranks wholesaling and manufacturing as having the highest innovation propensity, with many of the service industries ranking substantially lower. Tourism[2], for example, displays a propensity to engage in either technological or non-technological innovation which is only half that of manufacturing[3]. The propensity to engage in technological innovation appears to be higher with larger firms than with smaller ones, suggesting that a concentration on the latter as an engine of innovation may be inappropriate.

The surveys show that the most important reported sources of ideas for innovation in Australia have been customers, internal R&D and intra-industry contacts. These are the key knowledge channels identified by the research outlined in Part One and this finding underlines the importance of processes and linkages with and among firms which disseminate knowledge and help push the pace of new technological developments.

The most important reported impediment to innovation identified by the surveys was access to appropriate sources of finance. This is not surprising as it has been raised many times in the past in relation to other studies.

The Australian data also confirm that innovation is indeed an important driver of growth. The data show that 'innovative' firms have delivered better performance in terms of sales and export growth than have non-innovative firms, with innovators having been twice as likely to achieve sales growth greater than 50 per cent between 1992 and 1994 and 1.5 times as likely to achieve export growth greater than 50 per cent over the same period.

PRODUCTIVITY GROWTH

Productivity growth, actual and potential, is a useful means of determining how well Australia is functioning as a learning economy. Unfortunately, Australian productivity growth is poor.

Australia's rates of productivity growth have lagged those of most of the non-Anglophone countries over the post-war period. They have been declining since the mid-1960s, although they have improved in the 1990s. Most of the Anglophone countries have lagged other

[2] Tourism is defined by the ABS as accommodation, cafes & restaurants.
[3] 51.6 per cent. As surveyed by the ABS.

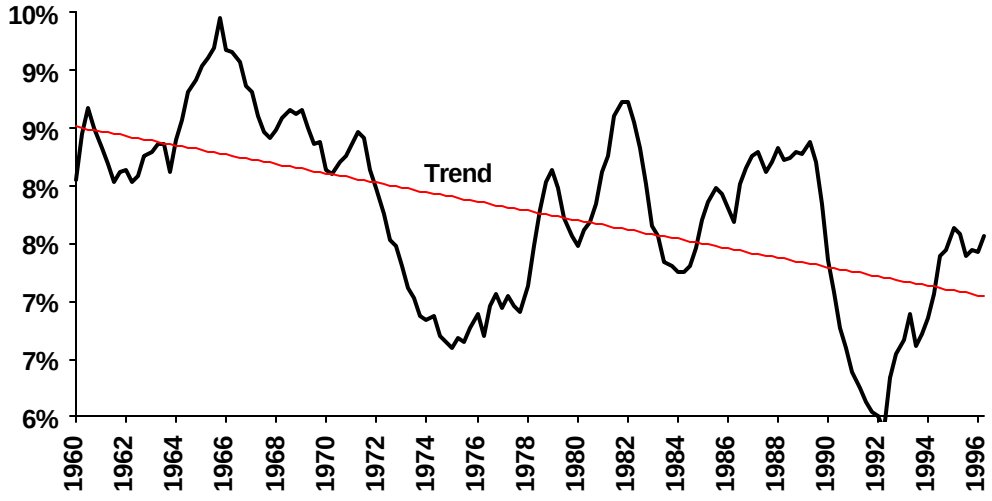
economies in both Europe and Asia. There is much debate regarding the sources of higher productivity growth in the Asian 'tigers' but there does seem to be a small but significant element which cannot be explained by orthodox economic prescriptions and which may be related to policy measures.

Within Australia the most significant increases in productivity over the post-1970 period have been in communications, transport and storage, manufacturing and the utilities. In contrast, in Australia, employment is broadly growing faster in industries with relatively poor productivity growth rates, and contracting or growing more slowly in industries with relatively high productivity growth rates. Clearly the industrial structure will influence overall national productivity growth since a preponderance of industries with low rates of productivity growth will bias aggregate performance downwards.

There are a number of factors which can impact on productivity. Some of these are discussed below.

***Machinery and Equipment**:* Machinery and equipment investment is everywhere regarded as a primary carrier of technological change and thus important for ongoing productivity growth. Australia shows a declining trend in such investment as shown in Figure 7.

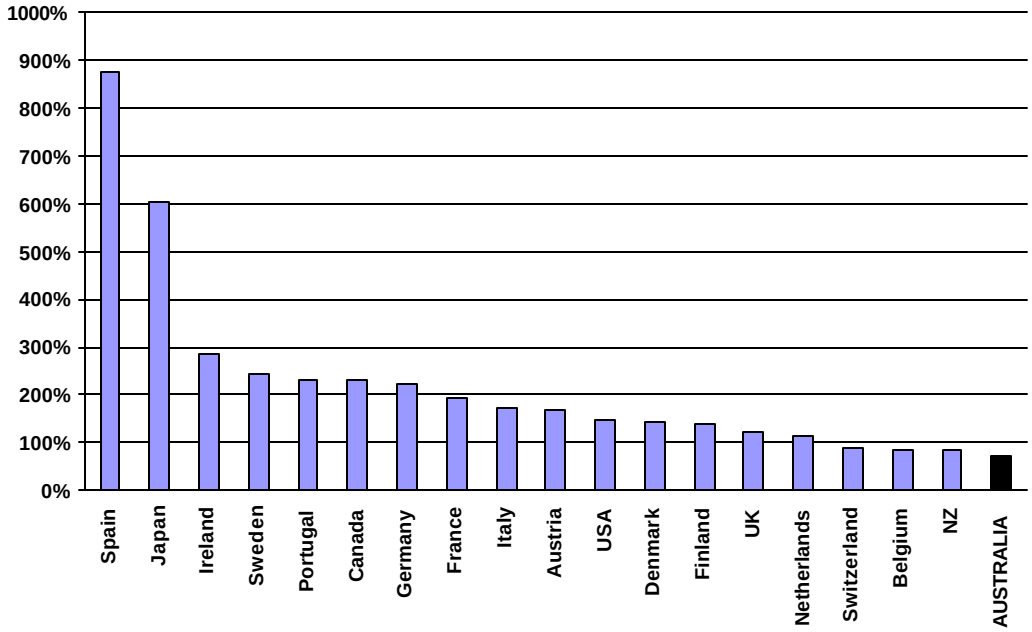
Figure 7
Australian Machinery & Equipment Investment as % GDP



Source: ABS 5206.0

Australia also rates poorly in international comparisons of growth in equipment capital stock per worker, as shown in Figure 8.

Figure 8
Change in Equipment Capital Stock* per Worker 1965-90



*Non-residential capital stock per worker, less non-residential & other construction.

Source: Penn World Tables

Thus the rate of acquisition of embodied knowledge in Australia seems to be relatively poor.

Taxation Bias. The Australian taxation system contains an inbuilt bias towards property investment compared to investment in machinery and equipment. This must be regarded as a significant impediment to increasing the embodied knowledge available to Australian industry and to raising productivity growth rates.

Investment in Public Infrastructure. Public infrastructure has been shown to significantly improve productivity, yet Australia's public capital expenditure has fallen sharply over the last decade and government capital expenditure is among the lowest in the OECD.

Human Resource Management Programs. Human resource management programs appear to be significant contributors to productivity growth. These programs include work teams, employee share ownership plans, inclusive work practices and profit sharing. Australian management has been slow to implement such practices.

Job Turnover. There appears to be a negative relationship between productivity growth and job turnover - countries which keep their employees for longer also tend to show higher productivity growth, perhaps because of training commitment or better intra-firm or firm-customer knowledge flows. Australia unfortunately has a relatively high rate of job turnover.

Income Inequality. International research consistently points to a negative link between income inequality and growth. There is some evidence (although hotly debated) that income inequality in Australia - especially market income inequality before compensation through the

tax/transfer system[4] - is both high by advanced country standards and increasing.

Thus, in terms of our record of productivity growth and our performance in relation to key productivity drivers, Australia's position looks relatively poor.

AUSTRALIA'S TRADE PATTERNS

Australia's trade trends show some recent improvement. This is particularly the case with recent growth rates of exports of elaborately transformed manufactures (ETMs). It is also positive that, although Australia's export mix has contributed to our deteriorating share of total OECD exports, this mix is now changing more into line with world trends.

Overall, however - and especially in relation to net trade outcomes - there remain some disappointing features.

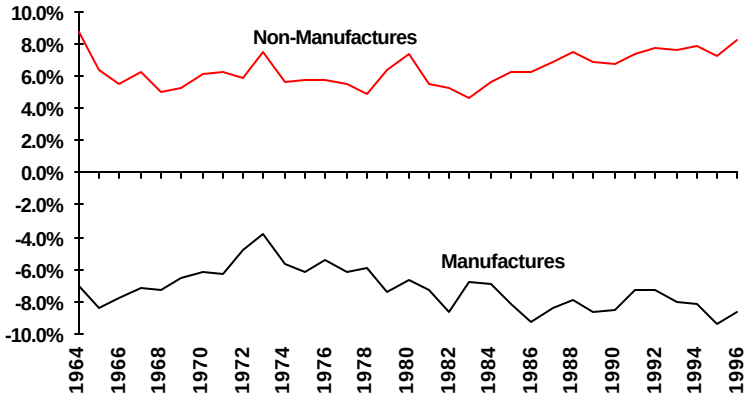
Firstly, ***Australia's export/import ratio is now below that of decades long past***. Extrapolations of current trends in the manufactures trade deficit suggest the possibility of a deficit as high as 13-14 per cent of GDP by the year 2020 in the absence of policy action or some substantial external shock. This is in the face of a long period of exchange rate decline and with it declines in the relative prices of both our products and our labour (30-40% since the mid 1970s). This decline has also occurred during a period of sustained trade liberalisation and economic reform, and it conflicts with standard economic prescriptions which would suggest that lower relative prices should improve exports versus imports.

Secondly, had the trends in manufactured exports and imports in the decade prior to the mid-1970s continued, Australia could, by now, be showing manufacturing sector trade *surpluses* approaching four per cent of GDP instead of deficits of twice that magnitude. In the years prior to 1973, when the exchange rate was rising strongly, real wages were increasing and high levels of import protection were in place, Australia was sharply increasing its share of OECD manufactured exports. This defies conventional economic wisdom and suggests that contemporary approaches to policy advice may need to be revisited. It also suggests that ***factors other than price may be more important for trade performance*** - a conclusion more in keeping with the learning economy framework which focuses on innovation, knowledge and linkages than price alone.

Thirdly, Australia is heavily engaged in the net export of primary commodities and tourism, on the one hand, and the large net import of manufactures, on the other, as shown in Figure 9.

[4] The research is almost unanimous in agreeing that market based inequality is rising. The area of dispute principally relates to the extent to which this is redressed by the tax/transfer system.

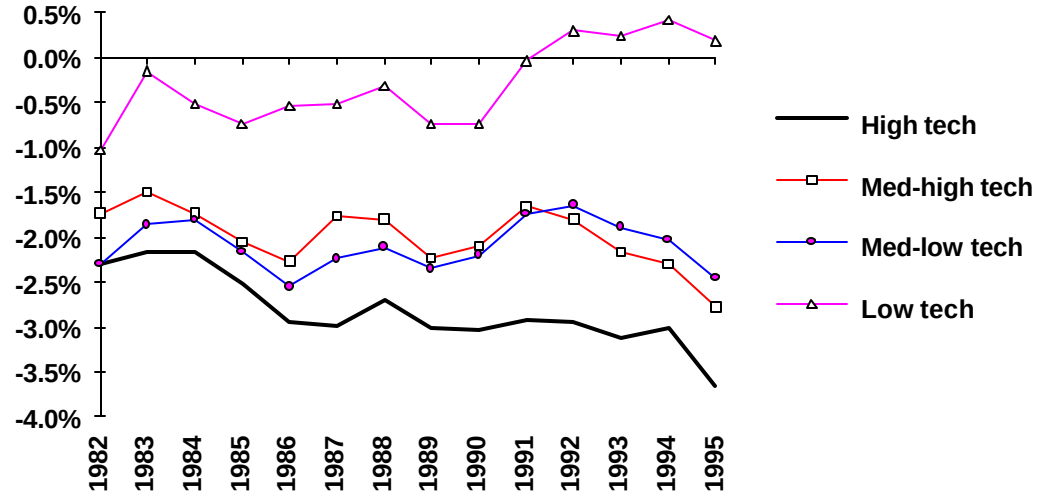
Figure 9
Non-Manufactures Trade Surplus v. Manufactures Trade Deficit
% GDP



Source: ABS commissioned data

The trade deficits are increasingly in the more knowledge-intensive industries while the surpluses are increasingly in the less knowledge-intensive industries, as shown in Figure 10.

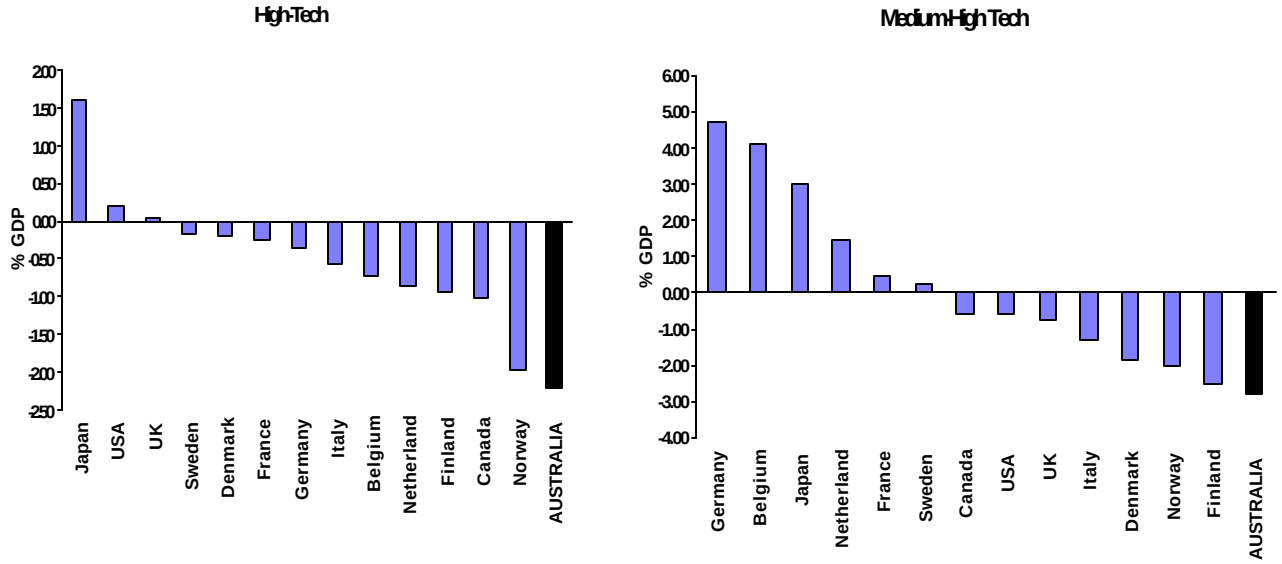
Figure 10
Australian Manufacturing Trade Balance by Knowledge Intensity
(% GDP)



Source: DIST unpublished data

Furthermore, Australia's trade deficit in high and medium-high technology goods is the largest in the advanced OECD countries, as shown in Figure 11.

Figure 11
Manufactures Trade Deficit by Technology Classification Various OECD Countries, % GDP, 1992



Source: DIST Unpublished data

These are the industries which both the theory and the data suggest are the fastest growing areas of world trade and which carry many of the greatest productivity benefits. Our deficits in these industries indicates that there may be substantial problems with Australia's overall industrial mix and that, left to themselves, trade patterns may exacerbate these problems.

This is the kind of trade structure which the OECD suggests is characterised by the need to compete via exchange rates and wages rather than by technology and innovation. In an environment where the exchange rate is effectively not targetable, the burden of competition is likely to be increasingly borne by wages.

Further, this trade structure carries with it negative employment and living standards implications, declining terms of trade and a significant ***exposure to greenhouse gas emission targets***. Nearly a quarter of our exports are either carbon-based or very heavy users of greenhouse gas emitting fuels and thus likely to be exposed to greenhouse gas targets. This trade structure is also, in the absence of policy intervention, likely to undermine the formation of linkages in key sectors of the economy which are rich in knowledge spillovers. This paper has continually stressed the importance of linkages in upgrading industrial capability.

Fourthly, the ***areas of significant trade improvement from a learning economy perspective have generally been in industries where some form of government policy intervention has been in evidence***. Australia's gross exports of more knowledge-intensive manufactures have increased sharply since the middle of the last decade, probably linked to the application of various industry programs together with, possibly, favourable movements in exchange rates.

Fifthly, the majority of Australia's exports are concentrated in a very small number of corporate

groups. ***The top fifty groups account for 75 per cent of all exports***. Therefore decisions by a relatively small number of companies can have an inordinate influence on Australia's overall trade outcomes. This means that policy-makers will need to 'get their hands dirty', as it were, and deal one-on-one with specific firms and sectors rather than simply take a generic approach to trade policy.

Sixthly, ***Australia is very heavily dependent on one country - Japan - for its trade income.*** Although this is changing, Japan still accounts for nearly a fifth of all export income. Further, 20% of all exports are processed through Japanese trading houses. A major setback in diplomatic relations between the two countries, a severe accident involving Japanese tourists, a shift in Japanese buying patterns, a resurgence of racism in Australia - even a mad person running amok and attacking Japanese tourists - would expose the economy to substantial declines in export revenue and growth.

SUMMARY OF AUSTRALIA'S PROBLEMS

This largely negative picture of Australia within a learning economy context has left us with a number of disturbing trends. These include:

- deteriorating terms of trade;
- an exacerbation of unemployment levels;
- downward pressure on real wages;
- expansion of lower wage employment;
- a propensity for reduced R&D;
- poor productivity growth; and
- increasing economic vulnerability.

The last point relating to vulnerability involves the following elements:

- two corporations are responsible for 12 per cent of total business R&D;
- our total R&D performance is still very dependent on the public sector which is susceptible to funding reductions;
- there is a very high corporate concentration of exports;
- Japan accounts for a quarter of all export income;
- less than 0.5 per cent of businesses account for nearly 40 per cent of business employment and nearly two-thirds of investment; and
- SMEs are increasingly vulnerable to pressure from large businesses and are likely to increasingly lag in wages, investment, innovation and export.

Further, background research for the report suggests the possibility of:

- unemployment rates exceeding 14 per cent by 2020;
- youth unemployment rates exceeding 40 per cent;
- average duration of unemployment above 2 years;

- part time employment almost 40 per cent of total employment;
- the manufacturing trade deficit possibly as large as 13 per cent of GDP; and
- continued relative growth of industries paying lower wages, training less, innovating less and with lower productivity growth.

PART THREE: THE WAY FORWARD

The main message from this study's broad assessment of Australia's capability, against the backdrop of the literature on the benefits of being an innovation-rich, knowledge-intensive learning economy, is that Australia has a major challenge to face. If world-wide growth and living standards are being driven largely by knowledge production and diffusion and a nation's ability to capture the value of innovation and technological development, then Australia risks being left behind.

Our study suggests that traditional approaches to policy development in this area may be poorly suited to the task in Australia. Many of the issues raised as important by the new research cannot be well integrated into traditional economic paradigms, which means that policy responses based on the current wisdom are likely to be inappropriate at best, and possibly even detrimental.

A new mindset is required. We must move beyond the current obsession with national, non-discriminatory policies which make no distinction between sector or size or type of company. We are currently seeing opposition to all initiatives which could be characterised as 'picking winners'. More sophisticated, deft and balanced approaches are needed. It is time to recognise that there can be sensible 'industry-level' approaches.

We should move away from the idea that we have *one* industry policy and recognise that we need *many* industry policies. Only then can we see what we need to do as a nation is to devise ways of leveraging our strengths to overcome or minimise our weaknesses.

We offer ten key pathways for action. Running through each set of policy pathways is the theme that we must improve our firms' capability to compete in the knowledge-intensive areas rather than take the low technology, low wage route in the future.

Pathway One: Acknowledge the importance of the structure of the Australian economy

Commonwealth and State governments must collectively recognise the vital importance of industrial structure for the welfare of Australians and ensure, via a whole-of-government approach, that all major policy changes are assessed for their impact on the industrial structure. Governments should also take a longer term perspective on these matters and be prepared to devise policy settings with durations longer than one electoral cycle.

Pathway Two: Integrate trade and industry policies

It is important that trade and industry policies be either jointly formulated, or developed from an integrated perspective incorporating equal consideration of likely impacts in both areas.

Pathway Three: Shift the economy towards greater knowledge and innovation intensity

Australian governments must focus their attention on developing polices that will increase the production and net export of knowledge intensive goods and services. This includes R&D intensive manufactured goods as well as the more innovative traded services such as education. Governments should also realise that they are, in many sectors, the largest leading edge customers and should use their purchasing leverage to assist in the development of domestic industry, especially the more knowledge-intensive industry which is more dependent on such customers.

Pathway Four: Improve the operation of business networks

Inter-firm networking, as well as 'cluster audits', should be encouraged so as to facilitate greater cooperative activity among stakeholders. Further, policies aimed at attracting foreign transnational firms to Australia should be based on anchoring those firms within the economy via research, development, innovation and sourcing strategies which link them closely to the domestic industrial fabric.

Pathway Five: Target key productivity drivers

Further research should be conducted into the likely drivers of productivity growth, such as:

- the rates of investment in machinery and equipment, which may reflect changes in the industrial mix or biases in the taxation system;
- the use of human resources management programs;
- levels of public infrastructure provision;
- labour turnover rates;
- the commitment to training, especially management training;
- levels of income inequality;
- the quality of management.

and where relationships are found to be strong, government and private sector policies should be developed to target the relevant drivers.

Pathway Six: Ensure programs are performance-based

Programs which involve the expenditure of public funds, or tax or other publicly-derived benefits, should maximise, or in some cases mandate, the following features:

- increased investment in R&D or other innovative, capability-enhancing activities (e.g. market research);
- greater investment in training for both management and workforce;
- increased local sourcing;
- employment expansion;
- networking with others in the same or complementary sectors;
- retention of adequate minimum employment conditions;
- productivity growth;
- use of inclusive human resources management programs.

Pathway Seven: Build global distribution channels

Government should:

- encourage the emergence of a tier of Australian transnationals in high-knowledge industries with substantial global scale; and
- actively use its leverage - especially procurement leverage - to encourage foreign transnational firms operating in Australia in such industries to source and distribute products and services developed by local suppliers;
- investigate mechanisms for increasing the access to capital of small innovative firms, including examination of the foreign venture capital industry.

Pathway Eight: Invest in education and research infrastructure and training

Government should carefully weigh the possible long term cost to the nation of shorter term policy measures before eroding the resources of scientific and research institutions so essential for a learning economy. Further, the links between the private sector and R&D institutions should be strengthened, and public-private coordination of and commitment to increased training and retraining should become a cornerstone of policy in the years ahead.

Pathway Nine: Focus attention on innovation and knowledge as the bases of competition

Public policy and private sector attention should be focused on innovation and knowledge as the bases of competition. Governments should shift their policy emphasis from cost minimisation per

se towards innovation and technology development strategies. This should apply both to the domestic and international sectors.

Pathway Ten: Deal with real industries and their dynamics

Governments should get to know, and work with, individual sectors and firms in the development of policy rather than be driven by abstract theoretical constructs. The knowledge levels required of policy officials will necessitate adequate resource commitments by governments, even in periods of fiscal austerity. Greater public policy capability must be built and this will require closer communication between business and government, perhaps involving exchanges of senior personnel.

CONCLUDING REMARKS

All of these proposals involve much more sophisticated understandings of the working of the economy than are currently in evidence. In many ways, this involves a greater focus on micro variables, but not in the traditional sense of the neoclassical theory of the firm which concentrates largely on price determination. Rather, firm and industry level analyses should embrace all facets of behaviour from an innovation and knowledge perspective, including the ways in which firms organise their internal processes, their (often non-price) links with other firms and institutions, and the impact of macro policy settings and structural gaps in the economy on these key factors. Learning economies will dominate world competition in the twenty-first century; the requirements for successful competition are already visible to those who wish to see.

Upgrading local capability is critical. This is a relatively long term process and needs urgent attention. Experience elsewhere in the world suggests that such upgrading does not necessarily involve large amounts of government expenditure or significant amounts of foregone revenue. Relatively simple measures can make a substantial difference. What is important is that public policies are coherent and sustained over time, that industry is treated as a responsible partner and that industry both as a whole and as separate sectors work with government to improve the match between corporate and public interest.

The key is taking seriously the findings of the work which we have outlined in this report. These must be used to refocus the ways in which we analyse the functioning of the economy and hence how we pinpoint strengths and weaknesses. We need to see clearly what we have in terms of key players, in terms of clusters of firms and in terms of relevant skills and capabilities.

Policies need to be developed at a number of levels and in a number of areas, not just by governments but by all parties with a major interest in the outcomes. The group that needs to be involved clearly includes business but it also includes consumers and the representatives of labour. This is because decisions have a much better chance of being effectively implemented if all stakeholders have contributed to them and can see their value.

Jane Marceau
Karen Manley
Derek Sicklen

August 1997

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