



**BRIEFING PAPER
FOR THE
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**KNOWLEDGE ECONOMY OPPORTUNITIES
FOR AUSTRALIAN FIRMS
IN THE
ASIA-PACIFIC REGION**

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EXECUTIVE SUMMARY

This paper provides an overview of emerging opportunities for Australian firms in the Asia-Pacific region in the next decade. In essence, there are currently unrealised opportunities for Australia from two interrelated trends:

1. the shift towards the knowledge economy, characterised by not only more sophisticated production technologies and skills, but also a greater role for know-how, market and customer intelligence and strong working relationships and alliances with partners and stakeholders; and
2. the growing role of international production networks and the distribution of different elements of production around the globe.

Relative to other Western economies, Australia is poorly represented in high-growth knowledge-intensive industries and has weak links into global production chains and networks. While Australia has developed links in the Asia-Pacific, and has enhanced its exports to that region, there are emerging long term weaknesses that will challenge our ability to maintain a competitive position.

A critical issue is to enhance the proportion of Australia's exports and general economic activities that compete on the basis of superior knowledge and skills, rather than relying on traditional commodities. In this way, Australia can strengthen its international competitiveness and build closer links to the global economy, as more opportunities open up in knowledge-intensive global production chains.

Emerging opportunities need to be seen in terms of supply and demand side factors. Supply-side factors relevant to Australia include our sometimes unrecognised strengths in diversifying exports and the increasing knowledge-intensity of both commodities and various services. Sometimes products and services are combined to form a customised solution in Australia's business offerings. These embedded services, coupled with internal knowledge management, can be an essential component of the competitive advantage of many Australian SMEs. However, growing knowledge intensity in traditional exports is often hidden by the method of classification of trade statistics.

In Asia, supply-side weaknesses include the region's focus on IT infrastructure rather than knowledge-based changes in services and in the use of human resources. Demand side factors include the emerging patterns of social and demographic change, structural economic shifts and changes in demand for energy and environmental services, among other things. All of these provide untapped opportunities for Australian enterprises.

The paper has a number of implications for Australian businesses and policy makers.

Many Australian firms are becoming more knowledge intensive throughout their operations. By knowledge-intensive, we mean the adoption of more sophisticated production technologies, training of staff to enhance their skills, development of sophisticated sales and marketing techniques and conversion of knowledge within people's heads into formal procedures which can be promulgated throughout the firm.

However, a number of firms, particularly small and medium-sized firms (SMEs), lag in their adoption of knowledge management approaches and export orientation, and so, are not capitalising on opportunities available for knowledge-intensive organisations globally.

Social and economic changes in the Asia Pacific region are likely to provide major market opportunities for Australian firms. Global success is available to Australian firms that recognise the need to harness knowledge – through understanding customers, developing new products and services and improving in-house skills.

Australian State and Federal policy makers have generally undertaken macro-level industry analyses in considering export opportunities for firms. While this type of analysis is valid, it fails to recognise the export success that comes from the way firms are using knowledge to build their competitive edge.

Furthermore, Australian policy makers' focus on the knowledge economy has emphasised the adoption of information and communications technologies (ICTs), measured primarily in the form of purchasing of computer hardware and internet access. Thus, policy makers have tended to downplay the wider implications of non-ICT knowledge in their analyses. As a result, Australian policy makers are failing to give enough attention to rapidly emerging global and Asia-Pacific opportunities in knowledge-intensive industries. Policy makers have little understanding of how and why successful exporters are managing knowledge to build competitive competencies which allow them to capture elements of global production.

AUSTRALIA AND THE ASIA-PACIFIC REGION

Australia's growing linkages with the Asia-Pacific region, as evidenced by international trade, have been widely acknowledged. By 2002-03, North-East Asia accounted for 35% of Australia's total merchandise trade, with South-East Asia with 14% (Department of Foreign Affairs and Trade 2003c). Although other regions also represent major long-term growth markets, it is the changes in Asia which are potentially the most significant and which offer the most long term opportunities, should Australian firms seek to take advantage of them.

Two contrasting arguments have been presented to explain Australia's international competitive position. The optimistic perspective is that Australia's exports are rapidly expanding as a result of China's rapid growth since 1990, which has accelerated the expansion of Australia's mineral exports. Reports from the Department of Foreign Affairs and Trade (2002, 2003b) point to the complementary relationships between Australia and China with respect to international trade:

Due to its complementary trade specialisation and role as a major supplier to Chinese industry, Australia should continue to profit from Chinese economic expansion. In other East Asian economies, China's industrial expansion is stimulating restructuring that should help boost industrial efficiency and growth; this also should promote Australian exports to the region

(Department of Foreign Affairs and Trade, 2003b, xiv).

Other government reports are equally optimistic about the growth of Australia's trade with the Asia-Pacific region, buoyed by Free Trade agreements with growing economies such as Thailand, and increased demand for consumer products in countries such as India and the Philippines (Austrade, 2003).

The pessimistic perspective is that while Australia's mineral commodity exports are expanding rapidly, weaknesses exist in its long-term international competitive position. A particular problem is that Australia is poorly represented in high growth knowledge-intensive industries, and in the emerging global and regional division of production in these industries. A report by the World Bank focuses on East Asia's role in world exports and examines in detail the intra-regional trade taking place within the Asia-Pacific. Two areas of concern for Australia emerge from the study (Ng and Yeats, 2003):

i) while East Asian countries (excluding Japan) expanded their share of global exports from 5.4% in 1975 to 18.7% in 2001, Australia's share declined from 1.8% in 1975 to 1.3% in 2001; and

ii) the two industries which have driven East Asian intra-regional and global exports are primarily information and communications technologies (ICTs) and, to a lesser extent, automobiles and automobile components. Australia is weakly connected, at a global and Asia-Pacific scale, in both these industries.

No easy solutions exist for enhancing Australia's engagement with the Asia-Pacific and with other regions. It would be very difficult for Australia to gain a position in the highly competitive ICT manufacturing industry. However, a critical issue, which has been identified by many other governments and researchers, is to enhance the knowledge intensiveness of the economy in order to enhance international competitiveness and thus link more closely to the global economy.

ANALYTICAL FRAMEWORK

The central thrust of this paper is that Australia's exports need to compete on the basis of knowledge rather than traditional commodities, to ensure success in today's environment, where growing knowledge intensity is the key. However, we do not accept the argument that sophisticated manufacturing (ICTs) and business services are the *only* knowledge-intensive industries.

The Department of Foreign Affairs and Trade has pointed out that knowledge-based companies exist across all industry sectors and comprise the high value-added areas that rely on the innovative skills and knowledge of a highly educated workforce. Australian industry has an increasing number of knowledge-based companies in commodity industries, simple manufactures and many types of services. These companies sometimes do not have a tangible product, are often one or two-person businesses, and depend highly on their intellectual property.

Knowledge-based companies can operate at all stages of the business life cycle, from basic research and development to fully mature exporting companies (Department of Foreign Affairs and Trade, 2001a). Further, knowledge-based services are often bundled with manufactured products, particularly by contract manufacturers (Marceau et al 2002). The agricultural and mineral industries are also becoming more knowledge intensive, and leading Australian-based firms in these areas are highly innovative in adopting new knowledge-management techniques. Australia's overall international competitiveness depends on Australian-based firms becoming more knowledge intensive in their operations. This contributor to export success is unrecognised by Government and is, therefore, not reflected in policy settings or goals for Australian exporters and investment attraction programs.

This paper considers knowledge-based industries and export opportunities from a supply and demand perspective. On the demand-side are the social and economic changes taking place in the Asia-Pacific region which influence Australia's role in the global economy. Supply-side factors are mainly at a domestic level and shape Australia's international competitiveness.

SUPPLY-SIDE FACTORS OPERATING IN AUSTRALIA

While a large proportion of Australia's exports are in agricultural and mineral commodities and related manufacturing, some diversification has taken place in our exports in general, and with the Asia-Pacific region in particular. We focus here on the growing knowledge-intensive exports to the Asia-Pacific region and how Australia has been able to expand its exports due to its domestic strengths in key sectors. We focus

particularly on the tourism and education sectors, both of which have created changes in the supply chain into the domestic economy. There are other sectors where Australia has emerging strengths, but these have not been studied in any detail.

Australia has particular knowledge strengths. Its sophisticated economy has a well-developed knowledge infrastructure, comprehensive educational system, and an open and democratic political system. These knowledge strengths have enhanced merchandise and services exports. Marceau (2002) points out that firms which export may need to develop partnerships with firms overseas in order to successfully service the needs of customers. Recent case studies of small Australian firms by the authors have also highlighted the need for firms to innovate their internal systems, quality management and company structures if they are to deal with distant customers (Thorburn and Langdale, 2003). These systems demand excellent knowledge management and the ability to translate tacit knowledge (skills and know-how) into codified systems (procedures and policies) if the learning is to be spread throughout the firm and risks minimised.

Australia's services exports have also grown significantly in the past decade, although they remained static in terms of their overall composition of exports, at 21% in both 1992 and 2002 (Department of Foreign Affairs and Trade, 2003a). Tourism and education have been particularly significant, the latter including higher education, English language training and vocational education services delivered to students from the Asia-Pacific region and elsewhere.

There are also a variety of other multiplier impacts which affect the domestic economy, as these students purchase goods and services from within Australia (Department of Education, Science and Training, 2003). Tourism is now Australia's largest export sector, and education is the seventh largest export (Department of Foreign Affairs and Trade, 2003a, 147). In addition, long-term intangible benefits from Australian education exports exist, stemming from the large number of Asians who studied in Australia but have returned to their home countries. These ex-students are often sympathetic to Australia and are on the "Western wavelength" when negotiating with Australian firms (Thorburn, Langdale and Houghton, 2002, 74).

While these service exports are significant, official figures understate the contribution of services exports embedded in merchandise exports (Marceau 2002). While the official statistics measure exports by industries classified as service industries (for example, tourism, education, transport and business advisory services), the service components bundled in with the delivery of manufactured goods and commodities are not recorded separately. Thus the export statistics under-report the contribution of service to our overall export performance.

These embedded services, coupled with internal knowledge management, can be an essential component of the competitive advantage of many Australian SMEs. A recent set of case studies examining innovation amongst Australian SMEs addressed the issue of internal knowledge management and competitive advantage (Thorburn and Langdale 2003). Of the 15 manufacturers studied, most offered embedded services, or at least some degree of customisation, which enhanced the value of their product offering.

This successful approach is typified by Stolway Holdings, a NSW-based firm which manufactures custom-engineered heating, ventilation and air-conditioning solutions for the oil, gas, petrochemical and marine industries around the world. Part of its value is the improvements it can offer to its clients' set product specifications and it provides customised solutions according to client need. Stolway is formalising management of the company to facilitate rapid expansion and hence its internal knowledge management systems are crucial for future growth.

The growing diversity of merchandise and services exports to the Asia-Pacific and other regions represent a deepening of Australia's global linkages. This trend is important in enhancing the knowledge intensiveness of Australia's exports. Furthermore, significant interdependencies exist between different exports. For example, while educational exports are important in their own right, they also generate tourism (visits from family and friends). Similarly, education and training may be important value-adding components to commodity and merchandise exports.

Unfortunately, neither industry nor government has focused on the growing knowledge intensity of successful exporters and, as a result, both are missing potential opportunities to enhance Australia's global reach.

SUPPLY-SIDE FACTORS AFFECTING ASIA

While many Asian countries have made major economic improvements in the past decade, most have focused on ICT infrastructure, rather than underlying knowledge-based changes in human resources and institutions. Asian countries have focused on manufacturing ICT equipment rather than knowledge-intensive services, and have favoured large rather than smaller enterprises (OECD, 2000, 4). Furthermore, rapid economic change in Asia has meant that local suppliers in knowledge-intensive industries have difficulty in keeping up with demand (e.g., higher education services). These provide opportunities for exporters of such services, such as Australian educational institutions.

On the positive side, many Asia-Pacific companies have made enormous strides in their acquisition and development of knowledge management techniques, particularly in ICT industries. Taiwan's IT industry has become a world leader and is "plugged into" global production and knowledge networks (Chen, 2002; Fang et al., 2002; Wu and Hsu, 2001). Singapore has identified the knowledge economy as the key policy priority for its country and has achieved significant progress in this area (APEC 2003; Heng et al., 2002). Singapore's Master Plan for IT in Education plans, for example, to build on the country's infrastructure investments and train students in what they term "knowledge economy skills", defined as teamwork problem solving, creative and critical thinking and communication skills (Fruman, 2001).

Asia-Pacific countries, however, have a number of weaknesses in shifting into a knowledge economy. The Japanese knowledge theorist, Nonaka, has argued that many Asian nations depend on socialisation in other countries or regions to access important knowledge. Many Asian countries and companies have R&D centres in Silicon Valley and in American universities, which enable them to tap into the informal personal

networks in these centres and access key skills and know-how (Sigurdson, and Cheng, 2001).

DEMAND CHANGES IN ASIA

The preceding sections highlight strengths in Australia's supply capacity in knowledge-based services, as well as deficits in these same areas within Asian economies. The other part of the equation to be examined is the social/demographic, structural and economic changes occurring within Asia-Pacific itself, and which influence demand. Australian firms need a more detailed understanding of the social and economic changes taking place in the region in order to identify market opportunities.

i) Social and demographic change:

Major demographic and social changes are taking place in the Asia-Pacific region. In particular, population growth rates are slowing, particularly in the more developed countries. In Japan, the population is projected to fall from 127 million in 2000, to 121 million in 2030 (United Nations, 2003, 280-81). Even China's population, which will continue to increase until the year 2030, is predicted to fall to 1,395 million in 2050 (United Nations, 2003, 172-73). The slowdown in population growth will decrease the growth rate of demand, although this is likely to be offset by increases in the standard of living and purchasing power of consumers.

This slowdown in population growth will be associated with an ageing of the population. The percentage of the population above 65 in North-East Asia is projected to rise from 7.7% in 2000 to 17.2% in 2030 and 24% in 2050. South-East Asia is projected to follow a similar ageing profile: the percentage above 65 is projected to increase from 4.7% in 2000 to 9.8% in 2030 and 16.4% in 2050 (United Nations, 2003, 66-67 and 70-71). It is difficult to forecast the impact of ageing on the nature of demand, but it is likely to increase the demand for medical products and services, aged care and social welfare services.

These changes provide export opportunities for Australian firms in the health and aged care services field. Australian firms have been involved in the region in such areas as hospital management, design and construction of hospitals, health education and training, as well as in aged care services. There are also Australian firms developing specialised drug treatments for diseases which are currently of great concern in Asia, namely cancers and certain infectious tropical diseases such as malaria.

While considerable opportunities exist in the region, substantial differences in political systems, culture and different architectures of health care and aged care systems can make the export of these services difficult (Department of Human Services and Health, 1994). However, the region provides a significant long-term potential for Australian health and aged care services firms. It also allows Australia to engage more deeply with countries in the region.

ii) Structural economic shifts

Australia's engagement with the Asia-Pacific region needs to be examined in the context of major structural shifts taking place in these economies. It is beyond the purposes of this paper to fully review these shifts, but a number of key shifts taking place are the growing importance of international production networks and the shift into service-based economies.

a) Rising incomes in the Asia-Pacific region

Countries in the Asia-Pacific region have experienced major increases in their standard of living in the past twenty years. GDP in countries in East Asia grew by 5.6% in the 1980s and 6.4% in the 1990s, whereas in the OECD, the corresponding growth figures were 2.5% and 1.8% respectively. The trend is likely to be maintained in the future. Forecast growth for East Asia for 2001-2005 is 5.4% and 2006-2015 is 5.4%, while the corresponding expected growth figures for OECD countries are 1.4% and 2.4% (World Bank, 2003, 43). In addition, we have already seen that Asia-Pacific countries have become more strongly linked into globalisation trends and rapidly expanded their international trade and investment flows.

The forecast rapid growth in the Asia-Pacific region is likely to expand demand for Australia's mineral and agricultural commodities. In particular, demand will be led by rapid increases in China's role as a regional and global economic power (Australia. Department of Foreign Affairs and Trade 2002, 2003b).

b) Growing role of international production networks

At a macro-level, East Asia has grown rapidly in terms of its importance in global exports. As noted at the beginning of this paper, a study by the World Bank found that East Asian countries (excluding Japan) expanded their share of global exports from 5.4% in 1975 to 18.7% in 2001. Within the East Asian group, ASEAN grew from 2.7% to 6.3% in 2001. In contrast, Australia's share declined from 1.8% in 1975 to 1.3% in 2001 (Ng and Yeats, 2003, 3).

In particular, the East Asian region has expanded its level of intra-regional trade, with China emerging as a key hub country for components from the countries with sophisticated technology (e.g., Japan and South Korea) and from low-wage countries (e.g., Malaysia and Thailand). Thus China functions as a key assembly point for products, taking in components from other Asian economies before shipping them to the U.S. and, to a lesser extent, other industrialised countries (Ng and Yeats, 2003).

Regional production networks are most strongly developed in ICT industries, with many of these industries having strong intra-regional exports. Automobiles were also significant (Ng and Yeats, 2003). Other studies have noted that this is due, in part, to the dominance of the Australian market by subsidiaries of foreign-headquartered multinationals. The head offices of these firms set boundaries on both the location and scale of their subsidiaries' exports (Thorburn, Langdale and Houghton 2002). While Australia is relatively weakly linked into these regional networks in ICTs and automobiles, it does have strengths in niche areas. For example, Australian automobile

component manufacturers export to a number of countries, although tariff and non-tariff barriers limit exports to the Asia-Pacific region.

c) Shift into service-based economies

Asia-Pacific economies are following industrialised countries in terms of their overall economic shifts. The role of agriculture is declining, and while manufacturing plays an important role, a major rise in service-related activities has occurred in most countries (World Bank, 2003).

With the notable exceptions of ex-U.K. colonies of Singapore and Hong Kong, Asian countries' international competitiveness in services is relatively weak. This weakness is particularly true for knowledge-intensive business services. Traditionally, these services have been highly protected by their respective governments, but some deregulation has occurred, partly as a result of the GATS agreement in the WTO, but also as a result of broader deregulation trends. As a result, some growth in export opportunities is likely for Australian knowledge-intensive service firms (Allen Consulting Group, 2001). In particular, Australia's bilateral free trade agreements with Singapore and Thailand are likely to enhance services exports and investment flows. Furthermore, the extremely rapid growth in China is creating significant export market opportunities. For example, exports of educational services to China have been growing very rapidly.

iii) Changes in demand for energy

The demand for energy in the Asia-Pacific region has been growing faster than in any other region of the world, and this trend is likely to continue for the foreseeable future (International Energy Agency, 2003; APEC Energy Research Centre 1998). This rapid growth of demand is having a major impact on the prices of oil, natural gas and coal.

Australia is the world's largest coal exporter and is rapidly emerging as a major exporter of natural gas. Australia is already a major energy exporter to the Asia-Pacific region, particularly to Taiwan, Korea, Japan and, to a lesser extent, Singapore (Australian Bureau of Statistics 2002). These countries are markedly deficient in their domestic sources of energy (Australia. Department of Foreign Affairs and Trade 2001b, 91-96).

China is also emerging as a very large importer of energy, particularly oil: China's crude-oil imports last year rose 31% from the previous year to 91.1 million metric tons (Xu 2004). China imports Australian coking coal and will import LNG from Australia's North-West Shelf project from 2005. In addition, China has a preliminary agreement to import natural gas worth A\$25 billion over 25 years from the massive offshore Gorgon field off Western Australia (Asia Pulse, 2004).

Australia's energy exporters are becoming more knowledge-intensive in order to enhance their international competitiveness. For example, BHP Billiton and Woodside Petroleum, Australia's largest oil and natural gas exporters, have significant knowledge management programs. BHP Billiton has created affinity groups and management of knowledge inside the company, as well as with a network of suppliers in petroleum and

mining. The emphasis is on sharing information and knowledge (Anderson, 2000). Similarly, Woodside has progressively moved to network its knowledge resources. The company has created a number of communities of practice, formed around core business processes that allows collaboration and sharing amongst its employees. This shift has been essential to avoid wasteful duplication of effort and re-learning of old lessons. The biggest advantage of the on-line collaborative approach is that when a person raises a question, they not only receive an answer in a timely fashion, but the rest of the community members also benefit from having access to the responses (Chiri, 2003).

iv) Environmental issues

Rapid economic growth in the Asia-Pacific region and the associated substantial rises in energy consumption, have led to significant increases in environmental pollution. Energy consumption in the region, particularly in the poorer countries, is relatively inefficient per unit of GDP compared to industrialised countries.

These environmental problems are particularly apparent for China, given the country's heavy reliance on coal. China suffers from very high levels of environmental pollution from energy sources and has high levels of carbon dioxide and particulate emissions, as well as sulphur dioxide and nitrous oxides. A report by the World Health Organization in 2002 found that 7 of the 10 most polluted cities in the world are in China, with burning of coking coal the single most important source of air pollution (WHO 2002).

OPPORTUNITIES FOR AUSTRALIA

For this discussion, we adopt the framework developed by Fjeldstad and colleagues in Norway. They have been examining the competitive advantage of different firms according to their structure as a value chain, value shop or value network, defined as follows (Fjeldstad and Haanaes, 2001; Stabell and Fjeldstad,1998):

Value chains are the traditional model of value chains applicable to manufacturing and commodity producers. They transform inputs into refined outputs and often compete on cost. Value chains tend to be manufacturing, commodity and distribution firms that create value by transforming inputs into products. Raw materials and intermediate products are typically transported to the production facility that transforms the inputs into products which are shipped to customers (Stabell and Fjeldstad,1998, 416). Firms' competitive advantage in value chains arises from the ability to reduce costs through supply chain management and the implementation of sophisticated supply chain management systems which enhance communication along the chain as well as maximise efficiencies. Value chains are becoming more knowledge intensive.

Value shops create value by solving unique problems for customers through the mobilisation of resources. Examples are professional services such as medicine, law, architecture, and engineering. Other firms may have a value shop component, even though the primary activities of the firm have a value chain logic. Problem solving involves developing solutions tailored to problems that the clients will not - or more often cannot - solve themselves. The major value creation is linked to understanding the problem and finding solutions. Firms' competitive advantage in these types of

organisations may also rely on formation of strategic alliances and ability to tap into informal networks. A key constraint for value shops' exports is that they rely on trust on the part of customers. It is difficult for Australian value shops to create and maintain trust for customers in remote export markets. However, value shops can overcome customers' perceptions of risk through being able to point to past successes via word-of-mouth referees, large well-known customers or demonstration sites.

Value networks create value by facilitating a network relationship between their customers using a mediating technology. Examples are telecommunications carriers, industry associations, transportation companies, insurance companies and banks.

Here, we focus on value chains and value shops, leaving aside value networks. One reason is that Australian-based value networks (for example, telecommunications carriers and banks) have, in general, had poor success in their globalisation strategies.

i) Value shops: Case study of environmental services

Environmental pollution problems in the region have significant direct and indirect implications for Australian firms. The most immediate impact is on energy supply. Thermal coal exports may come under pressure given the potential of Asian countries to tax carbon imports. Tough new anti-pollution laws enacted at both national and municipal level in China will drive demand away from coal and towards cleaner energy sources such as LNG. Japan has also proposed a carbon tax on energy imports, which would particularly impact on coal (Pearson, 2003). On the other hand, Australian exports of LNG to the region are likely to benefit from the rapidly growing demand for "clean" energy.

The Asia-Pacific region's environmental problems have created a market for environmental services, delivered as customised solutions by small firms, which can be classified as value shops under Fjeldstad et al's model. A number of Australian firms already provide such services to the region. Some of these contracts have been obtained as a result of government-supported marketing directed at the Beijing Olympics in 2008 (which, in turn, built on the Green Sydney Olympics image in 2000). An example of the ability to build on success is Sydney-based Group GSA, an architectural firm that designed the Sydney International Shooting Centre for the 2000 Olympics. In 2003, the firm also won the contract to design the Shooting Range for the Beijing Olympics in 2008.¹ The winning design is partially underground to maximise energy efficiency. The firm has received numerous "green building" awards.

¹ Infolink Architectural online press release service, July 2003, <http://www.infolink.com.au/articles/e4/0c0182e4.asp>

Australia's aid budget also provides an avenue for environmental services firms' exports to the region. Other firms, however, are tackling these markets on their own, albeit with the aid of government programs such as Export Market Development Grants.

Unfortunately, while the scale of the environmental problems in the region is huge, there is little political will to solve them. For example, despite China's massive environmental problems associated with "dirty" energy generation, it relies heavily on international aid, particularly from Japan, to reduce the pollution (Armacost and Pyle, 2001). Japan has a major interest in reducing Chinese acid rain emissions, given that some of this pollution affects Japan. Korea's Overseas Development Agency, the Asia Development Bank and the World Bank also have funding allocated for pollution management programs in South-East Asia (UNEP 2000).

Thus, while the Asia-Pacific theoretically represents a large demand for environmental services, the market at present is relatively small and is served primarily from industrialised countries' aid budgets. However, it is likely that the market will expand in the future and offer significant opportunities for Australian firms.

ii) Value chains: Case study of agriculture commodity exporters

The possibility of Australia shifting into upstream and downstream knowledge-intensive activities associated with mineral and rural commodity exports has existed for some time. In particular, the Western Australian State Government has explored the possibilities of shifting into value-added and knowledge-intensive activities associated with the State's strong position as a mineral and agricultural commodity exporter (Western Australian Technology and Industry Advisory Council, 1999, 2000).

Traditionally, agricultural exports were not considered to be knowledge intensive, but they are becoming increasingly more so. We argue that knowledge management is enhancing the international competitiveness of these firms. Adoption of knowledge management techniques have changed the linkages of these firms with supplies, customers (Australian and overseas), R&D (in-house, research institutes and universities), etc. While many large firms have adopted knowledge management techniques, a considerable need exists for smaller firms to do the same.

While Australian agriculture has always been strongly export oriented, globalisation trends continue to shape the industry. In particular, supply chain management is becoming of increasing importance as a result of changes in the power of global retailers. Management of knowledge is central to the competitiveness of firms in these new value chains. In 2003, the Rabobank AgriBusiness Award for Excellence Supply Chain Management went to Nebru Plains beef export company.² The firm emails pictures of freshly slaughtered carcasses to its Japanese distributors, to enable Japanese butchers to bid online for individual animals. The firm, together with its abattoir, claims it is the only abattoir in Australia that can trace individual beef portions from the live animal to the export package. Each customer's purchase can be further tracked

² <http://www.globalsupermarket.com.au/meat.html>

through another online innovation, a “passport” which provides data and images of the farm on which the animal was raised, thus reassuring customers about the safety and quality of the product.

Australian agriculture is still strongly shaped by traditional perspectives. Many Australian farmers still view themselves as commodity producers, rather than as links in supply chains. Each link of the chain is viewed separately, and the relationship between buyer and seller is still mostly adversarial. It is difficult for individual small and medium-sized companies to achieve the levels of production and cost control required to be competitive at this level, particularly when rivals are taking the form of whole chains, rather than single businesses (Department of Agriculture, Fishing and Forestry, 1998).

A shift of power is occurring in many countries between retailers and processors. Two models of the industry are emerging: one is represented by the European model in which large retail chains are becoming dominant and taking charge of the value chain. The second model is found in the U.S. and is characterised by processors retaining power, although entering into closer relations with retailers (AEGIS, 2001, 3).

In the European model, large global European retailers are exerting a growing influence on value chains. Retailers demand assurances that the food they sell is safe and that it meets increasingly stringent standards for food safety and quality. At the same time, rationalisation is taking place among buying groups, with consolidation and joint ventures. These trends are leading to major changes in global supply chains: global standards are likely to emerge in such areas as primary production, processing, distribution, retail and food service (Department of Agriculture, Fisheries and Forestry, 2003).

Global supply chains are important in the international competitiveness of agriculture and agribusiness. In the Netherlands by the early-1990s, the government and agribusiness industry realised that the country faced severe threats to their strong position as a supplier of agricultural products to Europe. Despite being technically efficient producers, The Netherlands was rapidly losing cost competitiveness to suppliers from southern Europe, South Africa and South America. The Dutch identified the emerging trend among the European supermarket chains towards customer-responsive quality as a critical development for their industry. The Dutch agri-food sector therefore moved to reverse the traditional supply oriented agri-chains, towards ones that are demand oriented and customer driven (Department of Agriculture, Fisheries and Forestry, 2000, 36).

Knowledge management techniques are becoming increasingly important in these global supply chains. The Dutch have expanded the nature of collaboration between industry and the research sector, with the specific objective of upgrading learning and knowledge about supply chains on a shared basis. While Australia’s own agricultural extension programs offer a model for networked learning, a much more comprehensive program is needed throughout the agriculture and agribusiness industry (Department of Agriculture, Fisheries and Forestry, 2000, 40).

iii) Value chains: Case study of mineral commodity exporters

Like agriculture and agribusiness firms, the minerals industry has not been considered knowledge intensive. The industry has, however, become more knowledge intensive in the past decade, as a result of the growing globalisation of production, but also because of fierce competition and the need to become more skilled in all stages of the mining industry: exploration, extraction, processing, shipping and marketing.

For example, the exploration phase for minerals and oil and gas has become highly knowledge intensive. Resources exploration predicts where concentrations of valuable minerals or hydrocarbons may be located within the earth's crust. A good deal of the resources exploration process involves abstract thinking - the construction of concepts (Standing Committee on Industry and Resources. House of Representatives, 2003). Much of the exploration work that occurs in these firms is "value-shop" in nature - the task is to solve a particular problem for an internal customer. Knowledge management techniques are required in order to apply the learning gained from one project in the next exploration area.

Major Australian-based mining companies such as BHP Billiton and Rio Tinto are heavily involved in knowledge management techniques in other areas of their operations. For example, BHP Billiton has centralised back office services and has networked its knowledge to all parts of the organisation. In addition, it has created affinity groups and shares selected knowledge with key suppliers and customers (Anderson, Paul et al., 2000), an activity which is value-shop like in its approach. Similarly, it has located two marketing hubs in Singapore and in The Hague in The Netherlands. In Singapore, the focus is on the Asian energy market, built around coal, oil and gas, and carbon steel-making raw materials. In The Hague, the emphasis is on aluminium, base metals and the European energy coal market, as well as freight and logistics.

Some of the more recent export successes in minerals and energy, including the Woodside LNG contract with China, have been made possible by the bundling of training services with delivery of raw materials. In essence, these successful mining and energy firms have committed to providing training as a significant value-add with their raw materials. Training enhances skill transfer to the recipient and builds their own knowledge base, while the seller obtains a higher price for what is usually a commodity. The contribution of these value-added services to these companies' export success is unfortunately hidden in the official statistics which assign the whole export to the commodity sub-sector.

IMPLICATIONS

i) Government

In this paper, we have examined the issues relating to supply of knowledge-based services and value shop-like activities in Australia and the factors influencing demand for these services in Asia. Many countries have identified the need to shift into knowledge-intensive industries and focus on high value-added exports. This

knowledge-intensive focus is especially apparent among governments in the Asia-Pacific region which have had a strong focus on enhancing their country's export competitiveness.

Singapore is generally considered a leader in this area and has developed policies and brands which enhance its image as an "Intelligent Island". Singapore has been very effective in global "branding" its economy as a knowledge-intensive one (APEC, 2003). More importantly, it has been consistent in conveying this message to global business leaders (Low, 2003).

In contrast, Australian governments (Federal and state) have been inconsistent in their "vision" of how Australia is to be viewed by the rest of the world. Australia's branding still relies on tourist images (surf, rainforest, desert) rather than any ability to solve business problems or provide high quality products and services.

Traditionally, Australian policy makers have focused on analysing industries at a macro level in considering export opportunities. While it is a valid approach, we argue that it needs to be complemented with a micro-level approach, which considers the adoption of knowledge management in firms. Such an approach would provide policy makers with a deeper understanding of the dynamics of Australia's international competitive advantages and allow them to better formulate policy.

Federal and state governments need to adopt new policy approaches to meet emerging demands in Asia, particularly those created by industry restructuring. Much of the policy discussion of the knowledge economy in Australia and elsewhere has been conflated with the rapid adoption of ICTs. ICTs may be necessary, but they are not a sufficient condition for successful knowledge management strategies on the part of firms. In the case of commodity suppliers, state and Federal governments need to recognise the growing knowledge-intensiveness of bundled product and service delivery and seek opportunities for these bundled product-service options in order to increase income and value-add to raw commodity delivery. However, it is also likely that the changing face of demand will limit our opportunities to sell these commodities indefinitely, value-added or otherwise. Australia must also look to the future needs of major Asian trading partners and recognise that we will not be able to rely on these commodities to prop up our export markets forever.

Different issues arise in value chains in the minerals industry. State and Federal governments have focused on expanding Australia's value-capture in these supply chains by attempting to attract value-added processing plants. The shift towards new renewable and greenhouse-friendly energy sources in Asia and elsewhere, may undermine these moves and turn these projects into white elephants. Changes in demand within Asia also require responsive policies on the part of Australian governments. We have argued that significant opportunities are emerging in more knowledge-intensive products and services.

In the area of environmental services, opportunities exist for Australian firms to help reduce environmental problems caused by inefficient energy usage. In addition, a global trend towards greater decentralisation of energy supply is occurring and this trend is being combined with greater privatisation and deregulation of Asian countries'

energy supply systems. These trends, combined with the massive increases in demand for energy in the Asia-Pacific, particularly in China, are likely to lead to more demand for a wide range of services provided by consultants (value shops). Governments in Australia need to facilitate the searching for Asia-Pacific market opportunities by Australian-based firms, many of whom are too small to undertake extensive market analysis.

A particular concern of policy makers has been to increase the export orientation of Australian firms, particularly SMEs (Austrade, 2003). We would argue that understanding the differences between knowledge-intensive value chains and value shops is an important precursor to success here. These two types of firms are likely to need different types of support. The standard export approach of taking firms on a trade mission and waiting for the contract, is unlikely to be successful when working with value shop service providers because of the underlying importance of trust in these business relationships.

ii) Business

Leading edge Australian businesses have adopted knowledge management approaches to improve the efficiency of their operations. Case studies of SMEs that have successfully adopted knowledge management techniques and are exporting need to be publicised. We have pointed to 30 success stories (such as Stolway and others) in a recent publication sponsored by the Department of Industry Tourism and Resources (Thorburn and Langdale, 2003). A recent report by Dr Richard Hall also highlights how knowledge management by 16 Australian organisations, both large and small, contributes to competitiveness (Hall 2003).

We have briefly explored the social and economic changes taking place in the Asia-Pacific region, which have major implications for Australian firms. In particular, changes in demand – such as rising incomes, growing complexity in international production networks and rapid increases in demand for energy and environmental services – are likely to provide major market opportunities for Australian firms. Many firms that recognise the need to harness knowledge, through understanding customers, developing new products and services and improving their in-house skills, have improved their international competitiveness.

Australian firms need to use these skills to develop a more sophisticated understanding of current developments in the Asia-Pacific region, so that they can respond to emerging market opportunities. This is particularly important for SMEs, given their limited resources in market research. Better use of knowledge is an increasingly important pre-requisite for SME's to export or to take advantage of new opportunities in international and regional production networks.

CONCLUSION

Australia cannot be complacent and continue to pat itself on the back in relation to the success of commodity exports. We need to constantly look for opportunities that will enable today's SMEs to engage within the Region and become the larger firms that will provide the bulk of our exports in the future. Indeed, much of our success now relates not to the commodities we sell, but the invisible services that have enabled us to gain large contracts in key growth areas such as China. The challenge for government and business alike is to look to the future and plan to respond to new demand, rather than waiting passively for the meteor, in the shape of a radically different Asian market, to hit and wipe us out.

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