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Standing Committee on Science & Innovation
House of Representatives
Parliament of Australia

**EXAMINATION OF STRATEGIES TO OVERCOME
BARRIERS TO, AND FACTORS WHICH
DETERMINE, INNOVATION SUCCESS.**

Prepared By:

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This submission needs to be read in conjunction with the “Roach CRC Study 2005 – Australia – A Need to Improve Commercial Research and Development” attached. That study has been lodged with the “Exports & Infrastructure Inquiry” currently being conducted by the Prime Minister.

INTRODUCTION

Australia needs to identify more efficient strategies to develop commercial research, manufacturing and exports in order to overcome its growing foreign debt.

In 1981 Australia’s net foreign debt was \$9 billion, or 6% of GDP [ABS attached]. The foreign debt reached \$422 billion in December 2004, which was 51% of GDP. Interest costs on the foreign debt reached \$5.1 billion in the December quarter of 2004 (\$20 billion annually) and servicing the debt was 9.3% of Australia’s export income. [*The Australian* 2/3/05]. The escalating foreign debt ^(a) is unsustainable and needs to be urgently addressed.

The cause of the escalating foreign debt is Australia’s inability to manufacture “elaborately transformed manufactured goods (ETMs)” and to export them to the rest of the world.

Japan, with no natural resources, has a foreign surplus. Japan relies on commercial research and development (CR&D) to create innovation for its industry, which then manufactures the innovation for export.

Japan is 6 times more efficient than Australia in developing ETM exports from R&D expenditure ^(b). The Japanese Government is almost 12 times more effective than the Australian Government in creating exports from its R&D expenditure ^(b). The Japanese Government is 1800 times more efficient in the expenditure of CR&D in industry than Australian Government-run research institutions ^(b).

Japanese business is 4 times more efficient than Australian business in CR&D resulting in exports ^(b). The Japanese Government is 3 times more effective in getting the private sector to spend money on CR&D than the Australian Government.

Table 1: Expenditure on R&D as a percentage of GDP, OECD countries 2000-2001 (ABS Figures)

Country	Business (%)	Government (%)	Higher Education (%)	Total
Australia	0.72	0.35	0.41	1.53
Japan	2.11	0.29	0.43	2.98
Germany	1.75	0.34	0.40	2.49
Sweden	2.84	0.13	0.81	3.78

^(a) – Annexure (Australia’s Foreign Debt Levels)

^(b) – Annexure (Japan / Australia Comparison)

The difference between Australia and Japan is the infrastructure for CR&D for small to medium sized enterprises (SMEs). Japan has between 300 and 500 private sector commercial research centres. Australia has none.

The Federal and State bureaucracies in Australia have prevented the development of private sector commercial research centres because of their fear that they would be competition to the CSIRO and government-run research institutions. [See attached submission "ROACH CRC STUDY 2005" to the Prime Minister's "Export & Infrastructure Inquiry"]

PATHWAYS TO COMMERCIALISATION

The common feature of countries that successfully commercialise research and development (CR&D) is that they have private sector commercial research centres (CRCs). There are two types: Those run by large corporations, and those for small to medium size enterprises (SMEs).

Large companies such as IBM, Hewlett Packard, Sony, Toshiba, Krupp, Siemens and General Electric have their own CRCs. Australia has no large corporations with their own CRCs.

Small to medium sized enterprises (SMEs) also need private sector CRCs. These centres allow SMEs to cluster together to overcome the large number of learning curves involved in CR&D. Networking is the key to SMEs successfully developing innovation and this is best achieved through private sector CRCs ^(c).

Australia has no private sector CRCs for SMEs.

The Government should not be involved in trying to commercialise research [Roach CRC Study 2005].

CSIRO and Commercialisation.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is the Australian Government's key organisation involved in the development of research for industry. It is directly involved in the management of the 64 Co-operative Research Centres established in the past decade.

The Japanese Government is 1800 times more efficient than the Australian Government's public sector expenditure of CR&D that results in exports ^(b).

If there is a role for the CSIRO it should be in pure research, basic research and research for the public good. It should not be in the commercialisation of research or acting as a consulting service.

^(c) – Annexure (CRCs Networking)

Australia needs to carry out research in areas such as “the ozone layer”, “salt levels in the Murray Basin”, “radio astronomy”, “Antarctic”, and those “for the public good” areas that the CSIRO is renowned for.

Articles in “The Age” and “Australasian Science” highlight the problem of trying to commercialise the CSIRO. Dr Max Whitten was a CSIRO executive from 1981 to 1995:

The Age 6/7/2002.

“Whitten accused Garrett, the head of the CSIRO, of subverting the CSIRO’s traditional role of public research in favour of lucrative consulting work for government departments and the private sector.”

“The CSIRO now has a formal target of getting 30% of its income from external revenue (half of which comes from commissions from government departments and agencies).”

“The promise of massive increases in external earnings might have landed Garrett the job, but the strategy could shift CSIRO from being a powerhouse for public-good research into just another consulting firm.”

“Staff morale, says Whitten, is plummeting...half the divisional chiefs are looking elsewhere for jobs; internal surveys reveal many top managers are stressed....”

Australasian Science. Sept 2003. Editorial

“The issues raised reveal a deep divide between Garrett’s corporate ideology and the values of free inquiry cherished by his scientists.”

The issue concerning the CSIRO and its commercialisation has been around for decades. In 1992 I debated the then head of the CSIRO, Dr John Stocker, at a CEDA meeting on his attempts to commercialise the CSIRO. It is recorded in my letter to the Editor of The Australian newspaper 14/07/95.

The CSIRO is made up of people with research skills and proficient in writing research papers. It is not structured with people who are commercially competitive, and nor should it be. To compete with private sector commercial research centres in Japan, the US, Europe or China requires a completely different personality, one that is market driven and entrepreneurial.

Commercialisation should be left to the private sector and the government should not be involved in running any organisation engaged in CR&D, including the 64 Co-operative Research Centres.

Extracts:

“The primary role of Government in promoting advanced technology development should be supportive – not directive” (Miller and Cote, 1985).

“Experience overseas has shown that direct government involvement results, at best, in mediocrity and, more commonly, in a disappointing performance.”
Advanced Technology Development Strategy for Western Sydney. 1986.
Cameron McNamara and Dr Ed Blakely.

The pathways to private sector CRCs:

Private sector CRCs are an essential feature of the “pathways to commercialisation”. There are a number of pathways to the development of CRCs.

Pathway for an idea leading to commercialisation:

Idea → research → R&D → CRC → manufacturing → sales, exports.

Idea from marketing → CRC → manufacturing → sales, exports

Re-engineering existing technology → CRC → manufacturing → sales, exports.

Physical Infrastructures Helpful to Develop Commercialisation

1. Innovation schools
2. Innovation colleges and universities
3. CRCs
4. Technology Parks
5. Technology Satellite Cities, adjacent to existing cities and regional growth centres, and incorporating private sector CRCs, innovation universities and technology parks.

All the above can be interdependent and network with each other.

INTELLECTUAL PROPERTY AND PATENTS.

There needs to be a centralised patent structure which will evolve with the development of a number of private sector CRCs.

SKILLS AND BUSINESS KNOWLEDGE

The skills and business knowledge for commercialisation begin with the appropriate infrastructure of private sector CRCs.

Skills and business knowledge are further developed in the innovation schools, the innovation colleges and universities, the CRCs and the technology industries. They all network together to overcome shortages and develop the skills required in the changing innovation market. They need to be private sector driven.

CAPITAL AND RISK MANAGEMENT

The capital to develop private sector commercial research centres for SMEs is difficult. Banks and financial institutions are not interested in the initial capital injection because there is no immediate return. This is the reason the Japanese Government gives upfront grants and the US Government provides low interest deferred loans for the establishment of these centres.

Funding by Governments in the form of grants is usually applied at the upfront end of the innovation chain. Once the suitable projects have been identified, venture capital for various projects should be organised by the private sector CRCs. This model protects scientists, engineers, inventors and investors.

The current system in Australia of financing innovation often leaves inventors' shares, after several capital raisings, being watered down from 60%, to 6%, to 0.6%. The venture capitalists, merchant bankers and lawyers take the lions share, and often leave the scientists, engineers and inventors with little or no return.

The current capital raising system also results in high management fees by venture capitalists. Once the money is raised they often exit. Projects are rarely clustered, but left in isolation to perish, or have their innovations taken by others. There is a high failure rate and investors often receive no return. This explains the low rate of participation by the private sector in Australia compared to countries such as Japan, Germany, Switzerland and Sweden [Table 1].

Risk management is optimised in private sector CRCs where best practices can be continually monitored and reviewed.

Private CRCs continually apply risk management to:

- Venture capital in order to ensure investors receive high returns. This motivates them to return for future investments.
- Ensure scientists, engineers and inventors are properly rewarded.
- Each CR&D project to optimise returns.

RESEARCH AND MARKET LINKAGES

Attached is a diagram outlining the networking and linkages involved between private sector CRCs, industry, government, universities, other research organisations and the market ^(c).

The Australian Government should also carefully consider the role of JETRO, the Japanese Government's overseas marketing arm. JETRO provides commercial intelligence and potential innovative products and ideas to their own private sector CRCs for re-engineering and further CR&D.

FACTORS DETERMINING SUCCESS

The easiest way to determine the success of commercialisation is to compare expenditure on CR&D and the resulting level of exports. The factors which would determine success are:

1. Clustering of research projects.
2. Commercialisation of research completed in private sector Commercial Research Centres.
3. Government support in overcoming red tape.
4. Government support to develop infrastructure: CRCs, Innovation Universities, Technology Parks, Technology Satellite Cities.
5. Government support at the initial stage of identifying potential projects for venture capital funding.

STRATEGIES IN OTHER COUNTRIES THAT MAY BE USEFUL TO ADAPT IN AUSTRALIA

Australia should be following the successful models overseas and develop commercialisation of innovation in private sector commercial research centres. Countries with private sector CRCs include Japan, Germany, Sweden, United States and China. "China now has over 600 private sector CRCs, an increase of 200 since 2002" (*Technology Review*, April 05 p24).

However the CRCs should be Australian private sector CRCs. Foreign companies have the risk of doing their R&D in Australia with Australian staff and then transferring the CR&D to their parent companies for manufacture offshore.

The reason for Australia to encourage CR&D is to create our own jobs, manufacturing and exports from Australia.

CONCLUSION

Over the past 25 years many countries have developed technology based manufacturing through private sector CRCs. Australia has been trying its own path of commercialisation through government-run institutions. It is time to change.

Within a decade the foreign debt could be 100% of GDP. This would lead to a loss of confidence in the Australian dollar.

John Laird, the former MD of Australian National Industries stated in the 1980's regarding the Australian economy and the loss of our manufacturing sector that "The worst is yet to come." Australia has been living for too long exporting primary products and living off foreign debt for far too long.

Foreign debt enables overseas countries such as Japan and China to control the value of the \$A and our interest rate. They will continue to allow the dollar to remain at a level to maximise their exports to Australia. Whenever these foreign owners of our debt choose to call it in, the dollar will drop, interest rates will rise and others will own all our prime assets.

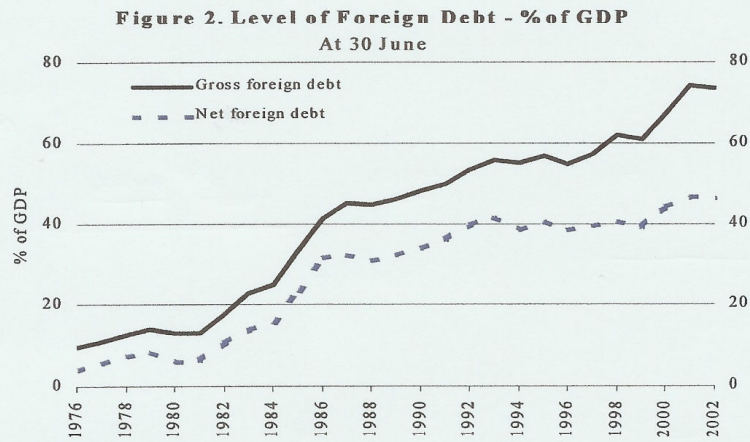
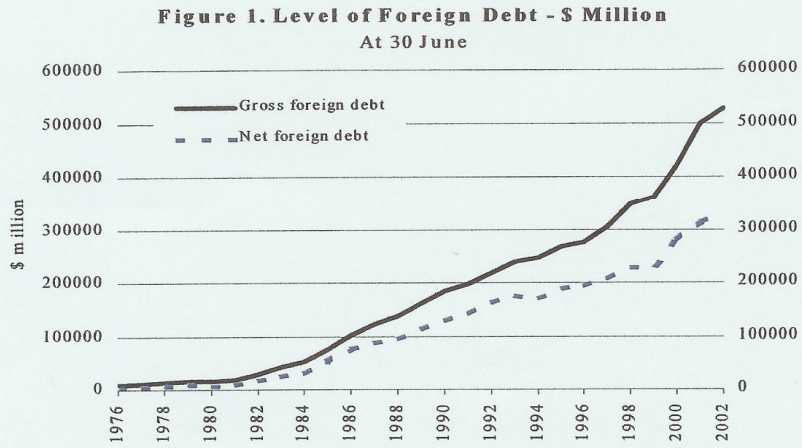
It is now time for urgent action on the issue and for all Australians, politicians, union, and business leaders to be united in a common goal of addressing the foreign debt, and supporting those who want to put in the effort to redress the current crisis by commercialising research, manufacturing and exporting.

ANNEXURE

- (a) Pictorial of Australia's Foreign Debt since 1976**
- (b) Comparison of R&D Expenditure to Exports in ETM's**
- (c) Networking Flow-Chart for Commercial Research Centres (CRCs)**

ANNEXURE (a):

Australia's Foreign Debt



ANNEXURE (b):

**COMPARISON OF R&D EXPENDITURE TO EXPORTS IN ETM'S
REQUIRING ON-GOING R&D IN JAPAN & AUSTRALIA**

	EXPENDITURE ON R&D (Billions A\$)	EXPORTS OF ETMs*□ (Billions A\$)	EXPORTS OF ETMs / \$ EXPENDITURE ON R&D	EFFICIENCY OF R&D RESULTING IN EXPORTS
JAPAN	222.7	650.27 (90% of 722.52) □	\$2.92	2.92 / 0.49 = 5.96
AUSTRALIA	11.03 (90% of 12.25) ■	5.45 (30% of 18.164) □	\$0.49	JAPAN IS 6 TIMES MORE EFFICIENT THAN AUSTRALIA+ # ¥
JAPANESE GOVERNMENT	53.81	650.27 □	\$12.08	12.08 / 1.02 = 11.84
AUSTRALIAN GOVERNMENT	5.32 (90% of 5.915) ■	5.45 □	\$1.02	12.08 / 1.02 = 11.84 JAPANESE GOVERNMENT IS 12 TIMES MORE EFFICIENT THAN AUSTRALIAN GOVERNMENT + # ¥
JAPANESE BUSINESS	157.68	650.27 □	\$4.12	4.12 / 1.01 = 4.07
AUSTRALIAN BUSINESS	5.38 (90% of 5.979) ■	5.45 □	\$1.01	4.12 / 1.01 = 4.07 JAPANESE BUSINESS IS FOUR TIMES MORE EFFICIENT THAN AUSTRALIAN BUSINESS # ¥
CSIRO: 2002, 2003, 2004	R&D appropriation. Mean for 2002, 2003, 2004	Sale of IP & Shares. Mean for 2002, 2003, 2004.	Income return per \$ of R&D appropriation by Australian Government.	12.08 / .0065 = 1816
	\$606.8 million	\$4.05 million	\$0.0065 (0.65 cents)	JAPANESE GOVERNMENT IS 1800 TIMES MORE EFFICIENT THAN AUSTRALIAN GOVERNMENT **

Source: Statistics obtained from; OECD, Australian Bureau of Statistics, CSIRO 2002/03/04 Annual Statements.

- Key:**
- * ETM - Elaborately Transformed Manufactured Goods.
 - 10% allowed for agricultural R&D. Approximation only.
 - % of ETMs requiring on-going R&D. Approximation only.
 - + Japanese Government spends large proportion of its R&D in private sector.
 - # Japanese R&D clustered in private sector commercial research centres.
 - ** Japanese Government does not commercialize R&D in Government-run research institutions.
 - ¥ Australia has NO private sector commercial research centres. Refer to "Roach CRC Study 2005".

ANNEXURE (c):

