COUNTY
Investment Management

THE BIOTECHNOLOGY REVOLUTION:

A UNIQUE OPPORTUNITY FOR AUSTRALIA*

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*This paper results from research undertaken as part of County's investment process in which we assess the impact on markets of major structural changes in society and the economy.

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Prologue

Put yourself forward in time 100 years. You are a 130 year-old athlete, and have just run your best time in the annual over-120s marathon. Last week you visited your local DNA Bank to replace a couple of limbs that were beginning to feel worn out, after some annoying compatibility problems you experienced after your second artificial heart transplant three years ago. Your diet for today includes the latest cloned cholesterol-free beef and genetically-engineered tomatoes, which were developed in the laboratory of locally-based conglomerate FlexiVeg Incorporated. Fortunately you have sufficient financial resources to pay for this indulgent lifestyle because you live in Australia, the centre of the world's biotechnology industry for the past century.

Does this all sound fanciful to you?

It is the contention of this paper that, on the contrary, the scenario described above is not only plausible, but is likely to be quite commonplace in the world to be inherited by our children - or perhaps (if we are very fortunate) to be achievable within our own lifetimes. The catalyst for this brave new world - and for the immense social changes, economic impacts and moral dilemmas it will bring - is the impending revolution in biotechnology research, a revolution which has the potential to unleash structural changes more profound than any technological advance in human history.

While the biotechnology revolution will pose many challenges, both practical and ethical, to all nations, Australia has the opportunity not only to rise to these challenges, but also to prosper from them. With some vision from Government, providing a suitable policy environment, and from business, in grasping the opportunity, Australia has the opportunity to be at the centre of "Genome Valley", the 21st century equivalent of today's icon of successful technological development, Silicon Valley.

Achieving such an outcome is the topic of this paper.

1 The biotechnology revolution

Much has been written on the biotechnology revolution, with interest being particularly heightened last year with the announcement of the cloning of the sheep named Dolly[1].

As with most scientific revolutions, the biotechnology revolution has evolved from many small steps interspersed with some giant leaps. The historical timeframe of developments in biotechnology can be set by the date of three significant leaps.

1. The first is the discovery of the three-dimensional, double helix structure of DNA by Watson and Crick in 1953. The structure of DNA encodes all of the genetic information of life. In a sense, Watson and Crick started the process of decoding the equivalent of the computer program that determines the nature of each life form.

2. A further major leap forward occurred in 1973 when Cohen and Boyer performed the first successful recombinant DNA experiment. Recombinant DNA technology allows pieces of DNA from one source to be recombined with DNA from another source. This technology is not only used for developments such as the cloning of Dolly but also for the development of genetically engineered drugs and as a tool in the ongoing search for the understanding of the genetic structure of life.

3. It was with this latter intent in mind that a further major step forward was initiated in 1988, with the launch of the human genome project[2]. The aim of this 15-year project, funded by the United States Department of Energy and National Institute of Health, is to determine the complete chemical structure of human DNA and to locate the estimated 50,000-100,000 genes within the human genetic structure. In effect, the project is aiming to complete the decoding of the program of life.

Already, the human genome project is helping to identify genes associated with diseases, thus allowing research into therapies[1]. In the early part of the next century, the flow-on effects of the project and associated technology will snowball, with profound implications for societies and economies.

Rather than speculate on specific applications and implications, we attempt to highlight the magnitude of the structural change that will be wrought by the biotechnology revolution by drawing on an analysis used to elucidate the impact on the US economy of the information technology revolution.

[1] See "The Biotech Century", *Business Week*, March 10, 1997, Page 36.
[2] For an overview see the World Wide Web link of the National Human Genome Research Institute: www.nhgri.nih.gov/HGP/

The paper[3] reproduced in Appendix A sets out to resolve the following paradox:

The United States has maintained a fairly constant productivity lead over Japan and Germany despite having a savings/investment rate which was not only the lowest for three decades, but which declined sharply throughout most of the period as well.

The paper explains this paradox by arguing that the United States' mastery of information technology so increased its "innovation quotient" as to compensate for the impact of declining savings. The reason that information technology was able to have this effect is that it is a so-called General Purpose Technology (GPT)[4]. The concept of a GPT is discussed on page 10 of Appendix A. It is recommended that the reader should read that discussion or, ideally, all of Appendix A before proceeding.

The paper in Appendix A argues that binary logic and electronic circuits (the heart of information technology) are today's GPT. The general-purpose nature of the technology is what has led to information technology having such a profound economic structural effect.

The structural logic of DNA and recombinant DNA technology (the heart of biotechnology) are likely to be the GPT of the 21st century. The special characteristic of this GPT is that it is the technology of life. As a consequence, the impact of this GPT is likely to be more profound than any before[5].

Mastery by a country of the GPT of biotechnology is bound to result in an accelerating innovation quotient, just as in the case of information technology. The domination of aspects of information technology, such as Microsoft's dominance of PC operating systems with its Windows product, is to some disturbing[6]. Domination by countries or companies of the GPT of biotechnology will bestow power that will make the information technology domination issues seem insignificant.

The granting of patents over biotechnological discoveries is facilitating the potential for domination. The logic for awarding patents in biotechnology is exactly as for other areas of innovation. The difference, that has caused controversy, is that patents are being awarded over fundamental elements of life.

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[3] This analysis is inspired by an August 1995 report from Strategic Economic Decisions Inc., reproduced as Appendix A, with their kind permission.

[4] See Appendix A and "General Purpose Technologies: Engines for Growth?", T Bresnahan and M Trajtenberg, National Bureau of Economic Research, Working Paper No. 4148, 1992.

[5] Previous General Purpose Technologies, apart from electronic circuits, include printing and the steam engine.

[6] See, for example, "Court warns off 'bully' Microsoft", *The Weekend Australian*, December 13-14, 1997, Page 16 or "Justice vs. Microsoft: What's The Big Deal", *Business Week*, December 1, 1997, Page 63.

An interesting review of this controversy can be found in a paper by McNally and Wheale[7], in which the authors propose that biotechnology patents will lead to significant structural change, which they characterise as follows:

Biotechnological innovation constitutes a new "regime of accumulation" while the globalisation of intellectual property rights in genetically engineered life forms constitutes a new "mode of regulation". The combination of the two is creating a new global order dominated by the bio-industrial complex.

Much of the remainder of this paper is concerned with Australia's place in this new global order.

[7] "Biopatenting and biodiversity: comparative advantages in the new global order." *The Ecologist*, September 1996, Page 222.

2. Lessons for Australia

Cries of lack of government "vision" have become familiar in Australia in recent times, resulting in the Prime Minister's policy statement "Investing for Growth"[8]. Be they associated with high unemployment or the need for industry policy, we believe that the root cause of these pleadings is the perception that Australia is ill-prepared to deal with the massive structural change that is currently sweeping the world.

Change, generally labelled as "globalisation"[9], can be seen as exporting Australian jobs, increasing unemployment, and as intensifying the corporate competitive environment, resulting in calls for industry policy.

The massive structural change to an "information economy" in the developed world can be seen as sweeping past Australia, leading to massive opportunity in the United States and some other countries[10].

National benefit from structural change does not occur solely by chance. Planning by government and industry in anticipation of the impact of structural change can have a dramatic effect on whether a country is a winner or loser from change.

The strong position of the United States in information technology arguably stems from the hundreds of billions of dollars of U.S. Government expenditure on information technology research and development as a result of the space and arms races[11]. The United States Government foresaw the change that would result from such technology admittedly, in very narrow fields. This investment has spilled over into myriad related fields giving the United States unrivalled superiority in commercial information technology.

The Australian Government's initiatives to catch up in information technology[8] are admirable but are 40 years too late to capture the most high value advantage. This is the time that it has taken Silicon Valley to develop from its roots to the information technology powerhouse that it is today[12] [13].

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[8] The statement is available on the Internet at www.dist.gov.au/growth. See also "Going for Growth: Business Programs for Investment, Innovation and Export", D Mortimer, Commonwealth of Australia, June 1997.

[9] "Globalisation vs Tribalisation: A County Theme for the 90's", *County InHouse*, County NatWest Investment Management, August 1995.

[10] "The Global Information Economy: The Way Ahead", The Information Industries Taskforce, Professor A Goldsworthy, Chairman, Commonwealth of Australia, July 1997.

[11] United States Budget for Fiscal Year 1996, Tables 9.7 & 9.8

[12] "Silicon Valley: How it really works", *Business Week*, August 18, 1997, Page 46.

[13] "Survey: Silicon Valley", *The Economist*, March 29, 1997, Page 66.

Australians should be asking how are we going to be at the centre of the "Silicon Valley" of the next revolution. This requires looking to the structural changes that are likely to have profound global repercussions early in the next century, rather than just attempting to catch up with the structural changes of the past.

The biotechnology revolution offers many opportunities for a nation prepared to embrace the change to its advantage. Australia is fortunately well positioned to benefit from the biotechnology revolution.

3. SWOT analysis

To take a systematic approach to forming an appropriate response to such change, we undertake an analysis of Australia's Strengths, Weaknesses, Opportunities and Threats (SWOT) in relation to the biotechnology revolution.

3.1 Threats

We start with threats to get the potential bad news out of the way.

The primary focus of this paper is the economic impact of the biotechnology revolution and the social consequences that flow from the economics. We thus do not consider the potential ethical and related social consequences of the revolution, although these pose many threats that certainly require considerable attention.

The economic threat from the biotechnology revolution is primarily to our balance of trade. The structural changes described in the previous section will lead to an increasing proportion of our consumption being in goods and services that result either directly or indirectly from the GPT of biotechnology.

Australia's poor position in transitioning from the agrarian age to the post industrial revolution era[14] and from that era to the information age has left us with a structural balance of payments deficit[15] and Australian jobs being "exported" overseas. As we move to the biotechnology age the threat of this trend continuing looms large.

Two additional structural effects magnify the threat. The first is globalisation, referred to earlier in this paper. In the world of global free trade of the 21st century, Australia will not be able to hide behind the tariff barriers that it has used to protect itself in previous transitions. Such trade protection has arguably left Australia in a worse position at the end of the transition by allowing Australia's business and government leaders to push on without a clear vision of Australia's place in the changed world. This protection will not be available in dealing with the transition to the biotechnology age. Vision will be required

[14] In the 1800s, Australia had the World's highest GDP per capita according to an OECD study "Monitoring the World Economy 1820-1992", OECD 1995. By 1992, Australia had fallen to 13th in the sample of 56 countries in the OECD study. See also, "The century the earth stood still", *The Economist*, December 20, 1997, Page 65.

[15] In 1994-95 Imports of Computer Merchandise, Services and Royalties were valued at $5,97 billion compared with exports of $1.73 billion. The deficit of $4.24 billion was a 16% increase on 1993-94. ("Balance of Payments and International Investment Position. 1994-95", Australian Bureau of Statistics.)

The second structural change is demographic. The Australian population is ageing, with the baby-boom demographic bulge passing into late middle age. For example, it is forecast[16] that the median age of the Australian population in 2031 will be 41.2 years, compared with 33.7 years in 1995, and that 20.7% of the population will be aged 65 or over, compared with 11.9% in 1995.

Since spending on health care tends to rise with age, this demographic structural change is expected to result in significantly increased health care expenditure[17] [18].

Apart from demographics, technological change is thought to be one of the most significant factors affecting health care expenditure[18] [19]. The massive structural change resulting from the rapid development of the GPT of biotechnology combined with the significant forecast ageing of the population makes forecasting of future health care expenditure as a percentage of GDP a most hazardous business.

Careful forecasts of health care expenditure in the United States using both actuarial and macroeconomic approaches show costs rising to anywhere from 25-50% of GDP depending on assumptions[20]. Whilst Australia is coming off a lower base of expenditure than the US (8.8% versus 14.0% in 1992), the impact of the structural changes discussed here is likely to be similar.

The threat to Australia of becoming increasingly dependent on the largely foreign controlled bio-industrial complex, referred to in the previous section, is thus particularly acute in the health care sector. The growing aged percentage of the population will increasingly demand access to the medical wonders wrought by biotechnology and woe betide any politician that stands in their way.

The area of agricultural biotechnology also represents a huge potential threat to Australia, with Australia's farm produce and resultant exports becoming increasingly dependent on biologically engineered seeds and related chemicals manufactured overseas.

[16] "Projections of the Populations of Australia States and Territories", Australian Bureau of Statistics publication 3222.0

[17] "Economic perspective on the health impact of the ageing of the Australian population in the 21st century", Paper presented on 23 September 1994 at the Seventh National Conference of the Australian Population Association at the Australian National University, J Gross, S Eckermann, M Pinyopusarerk, X Wen.

[18] "Health Care Reform – Controlling Spending and Increasing Efficiency", H Oxley and M MacFarlan, OECD Economics Working Paper No. 149, 1994

[19] "Can the NHS cope in the future?", A Harrison, J Dixon, B New, K Judge, British Medical Journal, November 1997, page 139.

[20] "Projections of health care expenditure as a share of GDP: actuarial and macroeconomic approaches.", M Warshawsky, Health Services Research, page 293.

The economic stress point of this threat is Australia's balance of payments. Australia already runs a large and growing balance of payments deficit as a result of its dependence on the rest of the world for the current GPT, namely information technology[15]. The medical, life and food related aspect of biotechnology greatly amplifies the threat of external dependence on next century's GPT.

3.2 Strengths

Australian has a remarkably strong starting point from which to benefit from the biotechnology revolution.

Before turning to immediately relevant strengths, it is worth taking a "big picture" view of Australia's strengths in Science and Technology. For this we turn to the "World Competitiveness Yearbook"[21]. This publication brings together for 46 countries a large number of factors that impact on a country's competitive position. Australia ranked 18 out of 45 in overall competitiveness. In the category of Science and Technology, Australia 's highest rankings are:

Number of patents in force:	10/46
Total expenditure on R&D:	12/46
Nobel Prizes	12/46

In the specific area of medical research, Australia has an outstanding track record[22]:

Australia's health and medical researchers produce about ten times more knowledge than would be expected for the size of our population and the money invested. We have had three [now four] Nobel Laureates in medicine and our scientists regularly win the world's most prestigious research awards.

Australian health and medical research is also very well organised. Dr John Bienenstock, Dean and Vice President of the Faculty of Health Sciences at McMaster University, who conducted an external review of the NHMRC is quoted as saying of the NHMRC[23]:

[21] "World Competitiveness Yearbook", IMD International, Switzerland, 1997.
[22] "Towards a Strategic Plan for the NHMRC: June 1995 to December 1996",National Health and Medical Research Council, 1995.
[23] *Annual Report of the NHMRC*, 1996, Page 8. The Annual Report also gives an excellent overview of the operation of the NHMRC and some of the outstanding research funded through its auspices. See also "Report of an External Review of the National Health and Medical Research Council", J Bienenstock, December 1993.

It is unique to this country that one organisation can have a remit that extends over the full field of health, and which includes responsibility for supporting and developing health research. This organisation can harvest the knowledge and goodwill of Australia's foremost experts at minimum cost, to provide governments and the community with comprehensive and authoritative advice on a host of complex issues which affect the nation's health.

Australia's history of well organised support for medical research has led to the development of a wealth of world leading research centres and institutes, a number of which have produced work at the leading edge of the biotechnology revolution.

Research success in these organisations has led to the development of a small Australian medical technology industry. The Healthcare and Biotechnology sector of the Australian Stock Exchange currently lists 37 companies[24], a number of which are conducting research at the forefront of the biotechnology revolution[25]. Most of these companies are quite small and not well established.

A great strength is the close cooperation between Australian Universities, Research Institutes and companies aiming to exploit biotechnology research. Cooperative Research Centres (CRCs) provide a government sponsored forum for such cooperation. For example, the CRC for Discovery of Genes for Common Human Diseases brings together listed biotechnology and pharmaceutical company AMRAD with the Walter and Eliza Hall Institute of Medical Research, the Murdoch Institute, the Queensland Institute for Medical Research and the Centre for Molecular and Cellular Biology of the University of Queensland.

Commercial arrangements between biotechnology companies and research institutes are also common. For example, the listed biotechnology company BioDiscovery has joint venture arrangements with The John Curtin School of Medical Research, CSIRO Entomology, The Garvan Institute of Medical Research and the Cytokine Unit of the University of New South Wales. Another fine example is the research commercialisation relationship which AMRAD has with ten of Australia's health and medical research institutes, which are also shareholders in AMRAD.

The strengths and environment described above are reminiscent of those existing in information technology in the early days of Silicon Valley. The opportunity for exploiting these strengths is considerable but they are countered by some major weaknesses which have the potential to prevent Australia realising a 21st century success similar to that of the US in information technology in this century.

[24] *Australian Financial Review*, p51, 22-23 November 1997.

[25] For some more information of Australian biotechnology organisations see the Internet site of the Australian Biotechnology Organisation at www.abn.asn.au

3.3 Opportunities

Australia's strength in medical research and biotechnology, positions it well to neutralise the threat described in section 3.1. It also provides Australia with the opportunity to build a stronger, diversified economy by being a leader in the GPT of the 21st century.

This opportunity has not been lost on other countries. The following is the executive summary of a supplement to the United States President's Fiscal Year 1994 Budget, which included a 1994 Biotechnology Research budget of US$4.3 billion[26]:

Biotechnology is a burgeoning industry worldwide, and analysts are predicting that it will have a profound impact on health care, agriculture, energy, and environmental management. By the year 2000, the biotechnology industry is projected to have sales reaching $50 billion in the United States. Development and production of biotechnological products will create thousands of new jobs and promote renewed economic growth, and has the potential of helping address agricultural, environmental, and health concerns in developing countries.

Biotechnology-related industry in the U.S. is characterized by very close linkage to its research base. Over the past three decades, with basic research support from the Federal government, the United States has become the international leader in biotechnology research, development, and commercialization. Increasing competition, however, has caused the United States' leadership in biotechnology to diminish.

Recognizing the profound impact biotechnology will have on society and the fragility of the U.S.'s position in this rapidly growing sector of the global economy, the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) selected biotechnology research for special emphasis in the FY 1994 Federal budget. The goal of the Federal Biotechnology Research initiative is to sustain and extend U.S. leadership in biotechnology research for the 21st century, in order to enhance the quality of life for all Americans, and to spur the growth of this important component of a healthy U.S. economy.

With the United States already having a dominant position in biotechnology and being determined both in the government and corporate[27] sectors to maintain that dominance, is it worth Australia trying to compete?

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[26] "In the National Interest – Biotechnology for the 21st Century: Realizing the Promise", A Report by the Committee on Life Sciences and Health of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET).

[27] One of the most determined US corporates in this regard is Monsanto, which presents a fascinating case study of the opportunities and resultant threats of the biotechnology revolution. See "Bucking biotech: the global threat of the new agribusiness.", K Dawkins, *Dollars and Sense*, May 1997, Page 26.

Within the global trade and business environment envisaged in the 21st century, the notion of countries competing against one another is an ill-defined concept. Biotechnology is likely to be dominated by a relatively small number of transnational corporations, in competition against one another. The correct question to ask is how can Australia prosper in such an environment.

The answer is to vigorously nurture the intellectual capital that provides so much of Australia's strength in medical technology and to rigorously protect and exploit the intellectual property that results from the wise application of this intellectual capital.

The opportunity to undertake the second part of this prescription is provided by the very intellectual property protection mechanisms that are a potential element of the threat discussed in section 3.1[7].

The global nature of the biotechnology industry, developments in information technology[28] and the intellectual property rather than goods nature of the above prescription mean that Australia's geographic location is not the disadvantage that it has been in past endeavours. Indeed, Australia's geographic proximity to the developing Asian region provides a great opportunity for the export of Australian medical technological expertise and product.

Apart from demographics and technology, as discussed in section 3.1, a particularly important factor affecting demand for health care is household income[18]. As incomes rise in the developing regions to Australia's north, health care expenditure as a percentage of GDP is also expected to rise. Much of this expenditure, especially on new technological developments, will be on imports. Australia should be well positioned to fill some large part of this demand.

A similar argument applies to nutritional needs. The continued development of Australia's northern neighbours is expected to greatly increase demand for food[29]. This demand is unlikely to be easily satisfied without ongoing biotechnological improvements to food production. Australia is well placed to supply much of this additional demand and to benefit greatly, provided it is not simply the provider of the soil and labour with the major benefits going to the foreign bio-industrial complex discussed previously.

[28] The Internet is playing a major role in the development of biotechnology and, in particular, the Human Genome project. A good starting point for browsing is the Human Genome Project World Wide Web site of the Oak Ridge National Laboratory of the United States Department of Energy at www.ornl.gov/TechResources/Human_Genome/home.html

[29] See, for example, "Global Food Projections to 2020: Implications for Investment", M W Rosegrant, M Agcaoili-Sombilla and N D Perez, International Food Policy Research Institute, Food, Agriculture and the Environment Discussion Paper 5, October 1995.

One of the particularly appealing aspects of a general-purpose technology as a driver for economic development is the spillover effect of the technology into myriad industry sectors[4]. The extraordinary economic growth generated in Silicon Valley[30] by the GPT of electronic circuits may well be replicated in some locales in the 21st century as a result of the biotechnology GPT.

Some cities and regions in the United States are already seizing this opportunity[31]. Australia's strengths in medical research and technology, highlighted in section 3.2, provide a great opportunity for a State Government to put in place an initiative to establish their capital city as the centre of a 21st century "Genome Valley". Some of the means by which this opportunity might be exploited are explored in section 4.

3.4 Weaknesses

Many perceived weaknesses holding back Australia's industrial development have been implicitly or explicitly described in various reports into aspects of Australian Industry[32]. Such weaknesses clearly affect Australia's ability to seize the opportunities presented in the previous section and make us more vulnerable to the threats described in section 3.1.

Rather than simply reiterate the weaknesses highlighted in these reports, a more challenging approach is adopted here based on a most insightful analysis entitled "Vital intangibles" in the Economist survey of Silicon Valley[13]. The article commences: *Imagine yourself as one of those many foreign bureaucrats now charged with trying to build Silicon Valleys of their own...As you wend your weary way from Sand Hill Road to Stanford University and San Jose, you ask yourself: "Why did it happen here?"*

Asking, "Why would it not happen here?" provides a means of exploring Australia's weaknesses with respect to the present topic. The Economist article provides food for thought:

[30] The GDP of Silicon Valley's 2 million inhabitants is estimated to be US$65 billion (see reference 10). By comparison, Australia's GDP, with about 18 million people, is about US$350 billion. Silicon Valley is home to around 7,000 electronics and software companies, with 11 startups being created every week. Between 1992 and 1996 125,000 new jobs were created in Silicon Valley. In 1996 62 new millionaires were created every day and real wages grew 5.1%, five times the national average. (See reference 6.)

[31] For example, see "San Diego's emerging 'DNA Valley' needs careful nurturing", E Shneour, The San Diego Union-Tribune, 13 August 1996, Page B-5 and "Special Feature: Biovision 2000: Growing Bioscience across North Carolina", *BT Catalyst*, June 1997.

[32] See, for example, references 8 and 10 and, specifically related to Science, see "A report to the Minister for Science and Technology, on Arrangements for Commonwealth Science and Technology", by the Chief Scientist, Professor John Stocker, Canberra, June 1997

Until recently, economists and politicians would put Silicon Valley's success down solely to a handful of good, solid reasons: the size and flexibility of its labour pool, the breadth of its network of suppliers, its access to venture capital and the excellence of its educational facilities and research institutions...

Research has increasingly concentrated on clusters-places (such as Hollywood or Silicon Valley) or communities (such as the overseas Chinese) where there is "something in the air" that encourages risk taking. This suggests that culture, irritatingly vague though it may sound, is more important to Silicon Valley's success than economic or technological factors. Here is a list of what it takes:

The article then goes onto elaborate on the following factors:

Tolerance of failure
Tolerance of treachery
Risk-seeking
Reinvestment in the community
Enthusiasm for change
Promotion on merit
Obsession with product
Collaboration
Variety
Anybody can play

The article concludes under the sub-heading ***Masterful inactivity***:

For would-be imitators of Silicon Valley, this list might not look altogether helpful. First, some of the required attributes seem somewhat ill defined (how would you explain the importance of "the cool idea" to an Asian autocrat?). Second, the list as a whole seems to imply that government has had little role to play in the valley's development. That conclusion would be wrong, but for reasons that are more complicated than they might at first appear.

A few people still believe that Silicon Valley was built by the American government. By one count, in the period 1958-74 the Pentagon paid for $1 billion-worth of semiconductor research. The Internet, too, began as a government project; several companies, including Netscape, have arisen, directly or indirectly, from state-funded research projects. Even today, 10% of Xerox PARC 's budget comes from the American government.

However, there is a clear difference between being a big customer and calling the shots. On only one occasion--in the mid-1980s, when the memory-chip industry was overrun by suspiciously cheap imports from Japan--has Silicon Valley gone to Washington for help; many in the valley still view the resulting Semiconductor Trade Agreement with shame. The prevailing attitude nowadays is that governments--however well-meaning--should stay well out of it.