

# Regional Clustering In the Biotechnology Industry: A Case Study of Melbourne

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## Abstract

Since the 1980s there has emerged a new stream of international sociological research concerned with regional clusters and networks in new technology industries, including biotechnology. There is little research along these lines in Australia. Nonetheless governments have become active in promoting regional clusters in industry, notably biotechnology. This paper examines the influence of clustering in the biotechnology industry in Victoria. Whereas private biotechnology companies started by scientists in research organisations are mainly located in six government-designated 'precincts', other biotechnology companies in Victoria are more dispersed. The implication is that ownership and financial considerations give rise to different locational considerations. This has important implications for the future of the industry in Victoria.

In the late twentieth century there emerged a raft of new technologies, underpinning the renewed dominance of the United States in the world economy. These new technologies – notably computing and biotechnology – were consistently associated with particular regions in the United States, notably 'Silicon Valley' (near San Francisco) and the Boston region. By the 1990s state governments across the United States were attempting to recreate such regional clusters, grounded in local face-to-face networks. More generally, regional and national governments around the world were doing their best to facilitate regional clusters of their own. In the field of biotechnology, the most ambitious projects included the BioValley initiative, stretching across a borders of France, Germany and Switzerland; the biotech incubator BioCity at Jeddah; a dedicated biotechnology city in Singapore; and the 'Bio21' precinct in Melbourne, pitched to 'see Melbourne and Victoria join Boston, San Diego, Cambridge, Munich and others at the forefront of this sunrise industry' (Victorian Government 2003).

This paper is part of a larger project concerned with biotechnology clusters in the Australian context. It aims to identify the influence of geographical clustering in the Victorian biotechnology industry. First, it summarises the sociological literature concerning regional clusters. Second, it describes the

initiatives of the Commonwealth and Victorian governments around biotechnology, with particular reference to regional clusters. Third, it examines the structure of the biotechnology industry in Melbourne and Victoria, including the influence of clustering. Finally, the paper discusses the logic of clustering in the Victorian context, and possible directions for future sociological research on the biotechnology industry.

## The sociology of regional clusters

Since the 1980s there has emerged a new stream of international sociological research concerned with regional clusters and networks in new technology industries, including biotechnology. AnnaLee Saxenian's book *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* (1994) was a groundbreaking study in this respect. Saxenian described the way in which the dense overlapping networks and open labour markets of Silicon Valley promoted entrepreneurship, whereas the hierarchical bureaucracies of Route 128 (in the Boston region) choked it off.

In the wake of Saxenian, there was a large body of research – often government-sponsored - that emphasised the 'collectivist and institutional basis for successful co-ordination' of regional clusters. For example, David Keeble and Frank Wilkinson framed their European Union sponsored research in terms of 'institutional thickness', including trade associations, public sector involvement, collaboration with universities, interrelationships between suppliers and customers, and spin-offs of new firms from existing firms. Institutional thickness generated 'innovative milieu', with a proliferation of entrepreneurs. More specifically, social networks generated high rates of innovation and rapid diffusion of new techniques and good design. They also generated trust and cooperation, 'thereby strengthen[ing] inter-firm networks' (1999: 295-304).

A growing body of research emphasised the importance of regional clusters around biotechnology in particular. The US sociologist Walter Powell identified two critical dynamics here. The first operated at the level of research, drawing together 'firms, research universities, prestigious research hospitals, and nonprofit research institutes'. Second, 'despite talk about the mobility of capital, the most critical source of financing – first stage venture capital backing for startup companies, is local' (2001: 48). In the late 1990s, over 40% of the funding for US biotech companies was between a venture firm and a biotech located within 25 miles of each other.

Since the early 1990s Australian researchers have routinely referred to the importance of networks and clusters in the New Economy (Morkel 1993: 388-99; Brain 1999: 120-5). At the same time, there is - as Enright and Roberts observed in 2001 - 'very little research' along these lines (2001: 72). The main study of clustering in Australia by Marceau observed significant reduction in the strength of domestic linkages in the Australian economy. The implication was a 'hollowing out of many older industry clusters' and the failure of new regional networks and clusters to take their place (1999: 159). Similarly, a review of the literature by Enright and Roberts reached the con-

clusion that ‘most Australian industry clusters are very weak compared to those in other OECD countries’ (2001: 81).

## Governments and clusters

Throughout the 1980s and 1990s Australian federal and state governments introduced neo-liberal reforms, designed to ‘free the market’ from the constraints of government. By the early 1990s there was increasing disquiet concerning neo-liberalism, highlighted in the volatility of rural electorates and the emergence of the populist One Nation Party. The themes of networks and clusters emerged in the federal context as the Keating Labor government attempted to reestablish its social credentials through industry policy and regional development. In 1996 the newly elected Howard Liberal-National government turned its back on many regional clustering initiatives, but by the end of the decade it had renewed its interest (Enright and Roberts 2001: 72). Similarly, in 1999 the Bracks Labor government in Victoria took office on a wave of reaction against the radical neo-liberal Kennett Liberal-National government, whereupon it took up the themes of networks and clusters through its Department for State and Regional Development.

In 1999 the federal government launched *Backing Australia’s Ability: An innovation action plan for the future* (Commonwealth Government 1999). The following year it released its *National Biotechnology Strategy* (Commonwealth Government 2000), composed by a Biotechnology Consultative Group consisting of 22 members from business and research. The statement observed that biotechnology promised ‘to be the next wave of technological change, bringing changes as radical and pervasive as those wrought by the IT revolution’. Australia had ‘an excellent institutional base, and a number of innovative small companies which, given the right circumstances, could lead the development of new industries’. The statement identified the ‘development of clusters, incubators and networks’ as one of the key objectives of government.

In 2001 the Victorian Government launched its own *Biotechnology Strategic Development Plan for Victoria*. The foreword (by the Premier and his Minister for State and Regional Development) explained that the Plan ‘complements and builds on Australia’s National Biotechnology Strategy’. The Plan was predicated upon existing ‘precincts’, where key research and education organisations, hospitals and industry were already co-located. The Plan identified six precincts: Parkville-City, Prahran (Alfred Medical Research and Education Precinct), Clayton (Monash Health Research Precinct), Werribee, Bundoora and Heidelberg (Austin Biomedical Alliance Precinct). Such precincts facilitated ‘the development of critical mass, shared resources and focal points for the interchange of ideas’ (Victorian Government 2001: 18). Further investment in these precincts was designed to enhance these clusters. In particular, the \$400 million Bio21 Parkville development was ‘the cornerstone of Victoria’s biotechnology cluster’ (Victorian Government 2001: 20). The Plan declared its ‘vision’: ‘By 2010 Victoria is recognised as one of the world’s top five biotechnology locations for the vibrancy of its industry and quality of its research’ (Victorian Government 2001: 2).

## The biotechnology industry in Victoria

There are a variety of reports concerning the biotechnology industry in Victoria and Australia. The discussion of the biotechnology industry here is based upon the most recent of these reports (Fayle 2002; Victorian Government 2001; Commonwealth of Australia, Ernst & Young and Freehills 2001). It is also based upon the Ausbiotech website listing of member companies, and independent research of biotechnology companies through the public record and fieldwork.

As the various reports acknowledge, there are enduring methodological problems in building a profile of the biotechnology industry. The conventional approach is grounded in ‘core’ biotechnology companies as the unit of analysis. Fayle describes core companies as those ‘focused primarily on biotechnology; defined as the application of science and engineering in the direct or indirect use of living organisms or parts of organisms in their natural or modified forms, in an innovative manner, in the production of goods and services or to improve existing processes’ (2002: ii). Yet it is not always clear as to when a company’s biotechnology activities are ‘core’ or ‘related’, as reflected in changing patterns of classification in different reports (Commonwealth of Australia, Ernst & Young and Freehills 2001: 4). Nor are the boundaries between companies necessarily clear, given ‘groups of companies’, joint ventures, spin-offs and so on.

Bearing these limitations in mind, in June 2003 there were approximately 80 core biotechnology companies in Victoria, out of more than 200 in Australia (Fayle 2002; SDA Biotech 2002: 20). These companies had several common threads. They were overwhelmingly Australian-owned (68, or 85%) (Table 1). The majority of the companies (53, or 66%) had partnerships with universities, research institutes and hospitals in Melbourne; this was true for the Australian-owned companies (48 out of 68, or 71%) more than the foreign companies (5 out of 12, or 42%) (Table 2). Of the Australian-owned companies, most (52, or 76%) were private, rather than listed (table 1). They were, as the 2001 *Biotechnology Strategic Development Plan for Victoria* observed – ‘operating in a research-intensive early growth phase of business and within a wide spectrum of industry areas’ (Victorian Government 2001: 21).

**Table 1 Biotechnology companies in Victoria by ownership**

<b>Company Type by ownership</b>	<b>Total number (n, %)</b>
<b>Foreign-owned</b>	12 (15%)
<b>Australian-owned: listed</b>	16 (20%)
<b>Australian-owned: private</b>	52 (65%)
<b>Total</b>	80 (100%)

**Table 2 Biotechnology companies in Victoria: company ownership by local research partnerships (with universities, research institutes and hospitals)**

	<b>Foreign-owned (n, %)</b>	<b>Australian-owned: listed (n, %)</b>	<b>Australian-owned: private (n, %)</b>	<b>Total (n, %)</b>
<b>Local research partnership</b>	5 (42%)	13 (81%)	34 (65%)	53 (66%)
<b>No specified partnership</b>	7 (58%)	3 (19%)	18 (35%)	27 (47%)
<b>Total</b>	12 (100%)	16 (100%)	52 (100%)	80 (100%)

The companies were overwhelmingly located in Melbourne (76, or 95%), and largely located in Melbourne's inner suburbs (52, or 65%). The most common suburbs were (in order) the City of Melbourne (10 companies), Fitzroy (8), Parkville (7), Toorak (6), Clayton (6) and Richmond (5). The City-Parkville and Clayton were two of the 'precincts' identified by the 2001 *Biotechnology Strategic Development Plan for Victoria*. The remaining four precincts – Bundoora, Heidelberg, Prahran and Werribee – were the headquarters for two companies in each case. Altogether only 30 (38%) of the companies were located in the six designated precincts (table 3).

**Table 3 Biotechnology companies in Victoria: company ownership by location in one of the six government-designated precincts**

	<b>Foreign-owned (n, %)</b>	<b>Australian-owned: listed (n, %)</b>	<b>Australian-owned: private (n, %)</b>	<b>Total (n, %)</b>
<b>Precinct location</b>	1 (6%)	5 (31%)	24 (46%)	30 (38%)
<b>Other metropolitan</b>	10 (83%)	11 (69%)	25 (48%)	46 (57%)
<b>Regional</b>	1 (6%)	0 (0%)	3 (6%)	4 (5%)
<b>Total</b>	12 (100%)	16 (100%)	52 (100%)	80 (100%)

Given that the Australian-owned private companies form the largest group of companies in the biotechnology industry, it is helpful to disaggregate them by forms of private ownership. On this basis there were four main types of private companies (table 4). First, there were 5 businesses that can be designated as **established**, insofar as they were spin-offs of existing businesses.

The existing businesses were all in the agricultural sector. They provided start-up capital for the company, as well as infrastructure and market access. For example, Nugrain – formed in 1999 - was a joint venture between the listed company Nufarm that made most of its money from fertilizers and three grain handling companies (GrainCorp, AusBulk and Westfarmers Landmark). It was located at Laverton, on the outskirts of Melbourne where Nufarm was based.

**Table 4 Private Australian-owned companies in Victoria by types of ownership**

<b>Company Type by ownership</b>	<b>Total number (n, %)</b>
<b>'Established'</b>	5 (10%)
<b>'Entrepreneurial'</b>	14 (27%)
<b>'Financial'</b>	13 (25%)
<b>'Research'</b>	20 (38%)
<b>Total</b>	52 (100%)

Second, there were 14 companies that can be designated as **entrepreneurial**. In this instance the businesses were driven by entrepreneurs, who held a significant ownership stake in the new technology. Eight of these companies were part of the same group of companies (Genetic Technologies, a public company), and driven by the one entrepreneur (Dr Mervyn Jacobsen). Jacobsen himself was a Melbourne-born doctor, based in Fort Collins, Colorado. The original business was established in the inner suburb of Fitzroy in 1989, where all of the subsequent businesses are still located.

Third, there were 13 companies that can be designated as **financial**, insofar as their formation was driven by financial organisations and the purchase of commercial rights and licenses. For example, Ceralyd Biosciences was formed in 2000 through the purchase of the biota library belonging to AMRAD, a listed company located in Richmond, an inner suburb. The purchase involved a consortium of five investment groups, led by Rothschild Bioscience Managers. The new company was located alongside AMRAD at Richmond.

Fourth, there were 20 companies that can be designed as **research** companies. These companies were driven by universities (10), research institutes (6) and hospitals (4), seeking to commercialise their research discoveries. For example, Cryptopharma was a company started by scientists in the School of Chemistry and Faculty of Melbourne in 2000. It was based on campus in Parkville, and was designated as part of the Bio21 cluster. In 2003 the University of Melbourne website (2003) described it as 'currently seeking partners to invest in Cryptopharma as it moves into clinical trials of its agents'.

It is revealing to cross tabulate the different types of companies with research partnerships and location (tables 5 and 6). Predictably all of the 're-

search' companies – 20 out of 20, or 100% - have current partnerships with local universities, research institutes and hospitals. Moreover, 15 (75%) of these companies were located in the six precincts identified by the 2001 *Biotechnology Strategic Development Plan for Victoria*, reflecting the influence of the research organisations in the designation of these precincts.

**Table 5 Private Australian-owned biotechnology companies in Victoria: company ownership by local research partnerships (with universities, research institutes and hospitals)**

	<b>'Established'</b> (n, %)	<b>'Entrepreneurial'</b> (n, %)	<b>'Financial'</b> (n, %)	<b>'Research'</b> (n, %)	<b>Total</b> (n, %)
<b>Local research partnership</b>	3 (60%)	1 (7%)	10 (77%)	20 (100%)	53 (66%)
<b>No specified partnership</b>	2 (40%)	13 (93%)	3 (23%)	0 (0%)	27 (47%)
<b>Total</b>	5 (100%)	14 (100%)	13 (100%)	20 (100%)	52 (100%)

**Table 6 Private Australian-owned biotechnology companies in Victoria: company ownership by location in one of the six government-designated precincts**

	<b>'Established'</b> (n, %)	<b>'Entrepreneurial'</b> (n, %)	<b>'Financial'</b> (n, %)	<b>'Research'</b> (n, %)	<b>Total</b> (n, %)
<b>Precinct location</b>	1 (60%)	2 (14%)	6 (46%)	15 (75%)	24 (66%)
<b>Other</b>	4 (40%)	12 (86%)	7 (54%)	5 (25%)	27 (47%)
<b>Total</b>	5 (100%)	14 (100%)	13 (100%)	20 (100%)	52 (100%)

The 'financial' companies also had a relatively high proportion of partnerships with local research organizations; 10 out of 13, or 77%. At the same time, only 6 of these companies (46%) were based in the six precincts, of which five were based in the financial centre of the City of Melbourne. It is revealing that the listed companies had a similar profile (tables 2 and 3). Of the listed companies, 13 out of 16 (81%) had partnerships with local research organizations; 5 out of 16 (31%) were based in the six precincts; and three of these five companies were located in the City. In other words, the location of these companies was more likely to be shaped by considerations other than local research partnerships.

There were only 5 ‘established’ companies, of which 3 (60%) had partnerships with local research organizations. The location of these companies reflected the location of the parent companies, only one of which was located in the designated precincts.

Finally, the ‘entrepreneurial’ companies had a strikingly small proportion of partnerships with local research organizations; one out of 14, or 7%. Only two of these companies were located in the six precincts, and both of these were in the City of Melbourne. Although 8 companies were in Fitzroy, nearby the City-Parkville precinct, this reflected the location of the parent company Gene Technology, not the influence of research partnerships.

Briefly, the ownership structure of biotech companies seems to be a key variable in terms of the location of biotechnology companies.

## Conclusion

Since the 1990s there has emerged a new stream of international sociological research concerned with regional clusters and networks in new technology industries, including biotechnology. There is little research along these lines in Australia. Nonetheless governments have become active in promoting regional clusters in industry, notably biotechnology.

This article demonstrates that there is some evidence of clustering in the Victorian biotechnology industry. The majority of companies are located in the inner suburbs of Melbourne. Most companies also have partnerships with local universities, research institutes and hospitals. The clustering effect is exemplified by the fact that one-quarter (20) of the biotechnology companies in Victoria are grounded in local research organisations, of which three-quarters (15) are located in six ‘precincts’ identified by the Victorian government.

By the same token, an analysis of company ownership by location underlines the fact – as Powell (2001) observed – that research is only one dynamic that underpins clustering. Another important dynamic concerns the provision of capital. Whereas private biotechnology companies started by scientists in research organisations are mainly located in the six designated precincts, other biotechnology companies in Victoria are more dispersed. Only a minority of listed companies and private companies forged by financial organisations are located in the six precincts. Entrepreneurial private companies are even less likely to be located there. In other words, ownership and financial considerations give rise to different locational decisions. This has important implications for the future of biotechnology clustering in Victoria. For example, it raises the possibility that as companies seek further capital, they will be pressed to relocate to overseas regional clusters closer to venture capital funds. This issue will be the subject for future research in this project.



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