

## **Venture capital, biotechnology firms and network forms of organisation in the Antipodes**

Professor Michael Gilding  
Sociology  
Swinburne University of Technology  
[mgilding@swin.edu.au](mailto:mgilding@swin.edu.au)

Ms. Vikki Bunton  
Sociology  
Swinburne University of Technology  
[vbunton@swin.edu.au](mailto:vbunton@swin.edu.au)

### **Abstract:**

This paper addresses network forms of organisation among dedicated biotechnology firms (DBFs) in Melbourne, replicating the network methods of a major US study and drawing upon interviews with industry informants. It argues that the emerging body of research on biotechnology clusters and networks outside the world hubs places too much emphasis upon ‘precocious internationalization’ and ‘distant networking’ at the expense of regional clusters and networks – especially in relation to venture capital. Melbourne DBFs rely overwhelmingly upon regional finance from local and interstate financial firms. This is because venture capitalists in the industry take advantage of local knowledge, and are unwilling to consider investment in firms too far away from their homes. In turn, their investments promote experimentation with new financial conceptions of the firm and, more generally, network forms of organisation.

Since the early 1990s there has emerged a substantial sociological literature on ‘network forms of organization’ (Powell 1990; Podolny and Page 1998; Keeble and Wilkinson 1999; Powell et al. 2005). The literature is heavily focussed on high technology industries in the US and Europe, and the biotechnology industry in particular. It addresses network forms of organisation as vehicles for innovation, with strong tendencies towards regional clustering (that is, co-location in the same region). In this context, networks are facilitated by a ‘dense, transactional infrastructure of lawyers, financiers, and venture capitalists’ (Powell 2001: 60), and clustering depends at least partly upon the availability of local venture capital (Powell 2001: 48).

More recently, a literature has developed on network forms of organisation operating outside the major biotechnology clusters (Fontes 2005: 901; Rees 2005; McKelvey,

Alm and Riccaboni 2003; Cooke 2001; Felsenstein 2001; Saxenian and Hsu 2001; Echeverri-Carroll and Brennan 1999). The emerging consensus in this literature seems to be that ‘out-cluster’ biotechnology firms operate according to distinctive dynamics. Local collaborations are less important, and external collaborations are more so. Yet this literature barely addresses the influence of venture capital. Given the importance of venture capital for firm formation and its influence in the facilitation of networks, this is a major oversight.

There are few countries where distance is more of an issue than Australia. The word *antipodes* simultaneously denotes enormous distance *and* Australasia (Australia and New Zealand). This article addresses venture capital, biotechnology firms and network forms of organisation in the context of Melbourne, Australia.

### **Network forms of organisation and venture capital**

Notwithstanding the mobility of capital, research in the major biotechnology clusters demonstrates that ‘the most critical source of financing – first-stage venture capital backing for startup companies, is local’ (Powell 2001: 48). In the late 1990s, for example, over 40 per cent of the venture capital funding for US biotechnology companies was between a venture firm and a biotech located within 25 miles of each other.

Moreover, venture capitalists play an active role in facilitation of networks. In Powell’s words, they have become ‘the “Johnny Appleseeds” and marriage counsellors for relational contracting’ (Powell 2001: 61). In this context, they are ‘extremely savvy about valuing the worth of different network ties’:

Indeed, there is experimentation with altogether different financial conceptions of a firm. To wit, an established biotech company may spin off as a separate entity a promising research team in a newly emerging therapeutic area. Were this group to remain inside the existing firm, its steep R&D expenditures would cause the firm’s financial picture to look bleak. But by setting the operation up as a separate legal entity, while retaining partial control, the firm enables the new organization to compete for federal research grants, issue stock, attract new investors, and raise capital much as a startup firm would. The established firm is also buffered in terms of legal liability, as the new entity’s assets are treated separately if any legal issues arise. In short, these subsidiary spin-offs are a network alternative to the multidivisional firm, with attendant financial and legal advantages. (Powell 2001: 61)

There is now an emerging body of research on ‘out-cluster’ high technology firms; that is, new firms located outside the major biotechnology clusters. These studies – from Texas and Sweden to Greater Vancouver and Portugal - emphasise co-location with local research organisations as the basis for biotechnology firms (Fontes 2005: 908; McKelvey, Alm and Riccaboni 2003: 495; Rees 2005: 302). At the same time, they challenge the view that ‘industrial clusters are necessarily characterised by high levels of local collaboration’ (Rees 2005: 299). Instead, they describe how distance from the major world clusters gives rise to a ‘precocious internationalization’ (Fontes 2005: 904) through ‘distant networking’, building ‘connections with key actors and organizations located in more knowledge intensive regions’ and developing “‘alternative’ forms of proximity’ (Fontes 2005: 917). This occurs at the cost of ‘constant travel and periodic displacements’ (Fontes 2005: 918). Thorburn (1999) describes the same pattern in the Australian industry.

For the most part studies of ‘out-cluster’ high technology firms do not address the influence of venture capital. Thorburn is an exception insofar as she observes that the call for venture capital promotes ‘global expansion’ (Thorburn 1999: 342). The influence of venture capital and its articulation with the networks of ‘out-cluster’ firms warrants closer attention.

## **Method**

The main research for this study involved replicating the methods employed by Powell et al. in their network-based study of the US biotechnology industry (Powell et al. 2005). Powell et al. compiled a primary database of dedicated biotechnology firms (DBFs) for April of each year, and a secondary database of all interorganisational collaborations among these firms. These databases were then used to create ‘network visualisations’ (albeit networks mediated through DBFs), using the freeware package *Pajek*. Replicating this approach facilitates a more systematic approach to the study of networks far from world biotechnology clusters than that of most existing studies. The current paper is based on data for Melbourne-based DBF and their collaborations in April 2004.

Powell et al. defined DBFs as ‘independently operated, profit-seeking entities involved in human therapeutic and diagnostic applications of biotechnology’ (Powell et al. 2005: 1148). They excluded veterinary and agricultural biotechnology

companies; included both privately-held and publicly-traded firms; and excluded wholly-owned subsidiaries of pharmaceutical or chemical corporations. The researchers defined interorganisational collaborations as 'any contractual agreement to exchange or pool resources between a DBF and one or more partner organizations' (Powell et al. 2005: 1148), treating each agreement as a tie. They did not incorporate data on the scale of resource exchange; partly because such data was often unavailable, and partly because their primary interest was in the broad structure of networks. They coded partner organisations into six categories: public research organisations, large multinational pharmaceutical corporations, government institutes, financial entities, other biomedical companies, and other DBFs.

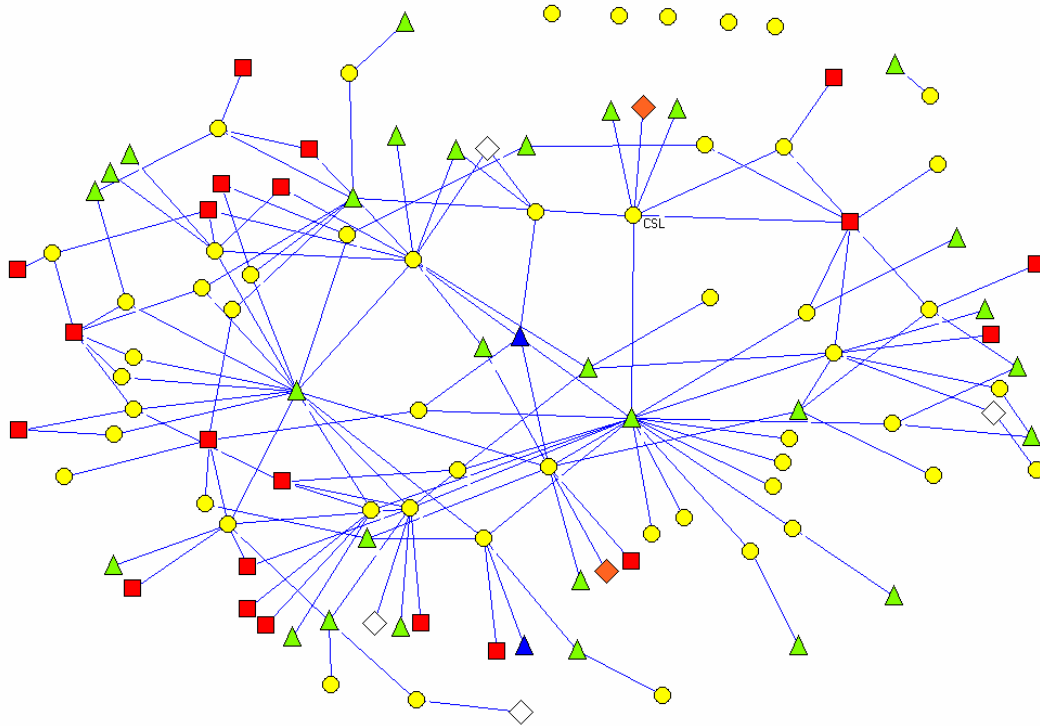
Financial ties presented Powell and his colleagues with more challenges than other interorganisational collaborations. For their purposes, they defined financial agreements as shareholdings of two per cent or more. It is often difficult to identify such shareholdings, and it is a crude measure of collaboration anyway. Accordingly, our own Australian data is far from definitive. Even so, it provides the most accurate available picture of financial relationships in the industry.

Further research for this study involved case studies of financial firms drawing upon the public record, and interviews with senior players in the Melbourne industry: 14 CEOs of Melbourne-based DBFs specialising in therapeutic and diagnostic applications (eight listed and six private), the senior executive of a foreign-owned DBF, and the CEO of a venture capital firm. The interviews were conducted between August 2003 and March 2004, almost all at company headquarters. Informants included 15 men and one woman; their median age was 48; and all but one was an Australian citizen. Interview schedules included open-ended questions about venture capital, clusters and networks. Most interviews took about an hour, and were conducted on the condition of confidentiality.

### **Local collaborations**

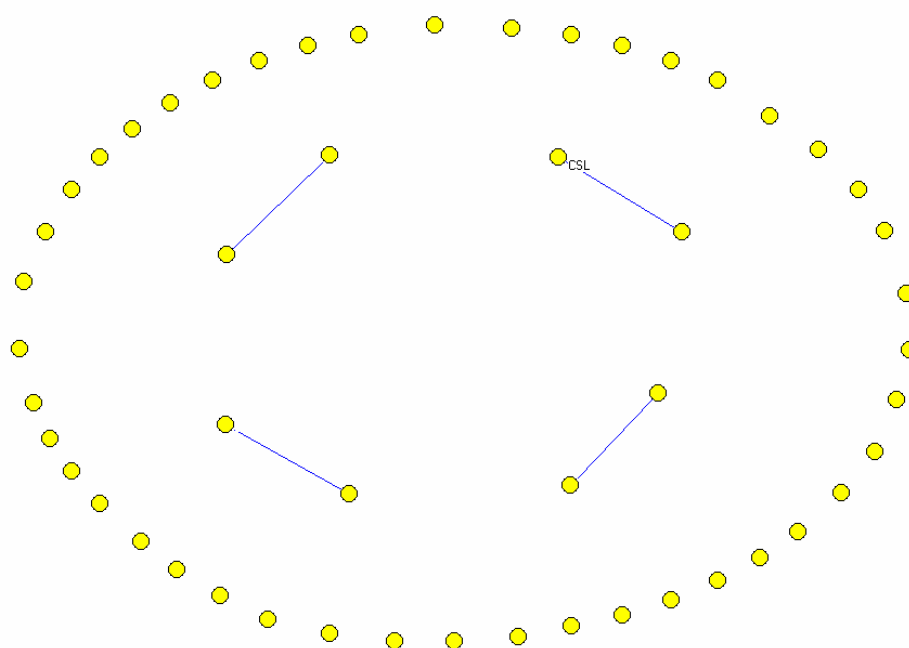
In April 2004 there were 52 Melbourne-based DBFs that met the definition of the US study. They varied immensely in scale, ranging from 7000 employees to none. The typical DBF, though, was private, recently-established and small, working on research originating in one of the Melbourne-based public research organisations.

Of the 52 Melbourne-based DBFs, 47 (90 per cent) had collaborations (150 of them) with 62 other Melbourne-based organisations. When these collaborations are configured as a network through *Pajek*, 46 DBFs (88 per cent) belong to the main component of the network diagram (fig. 1).



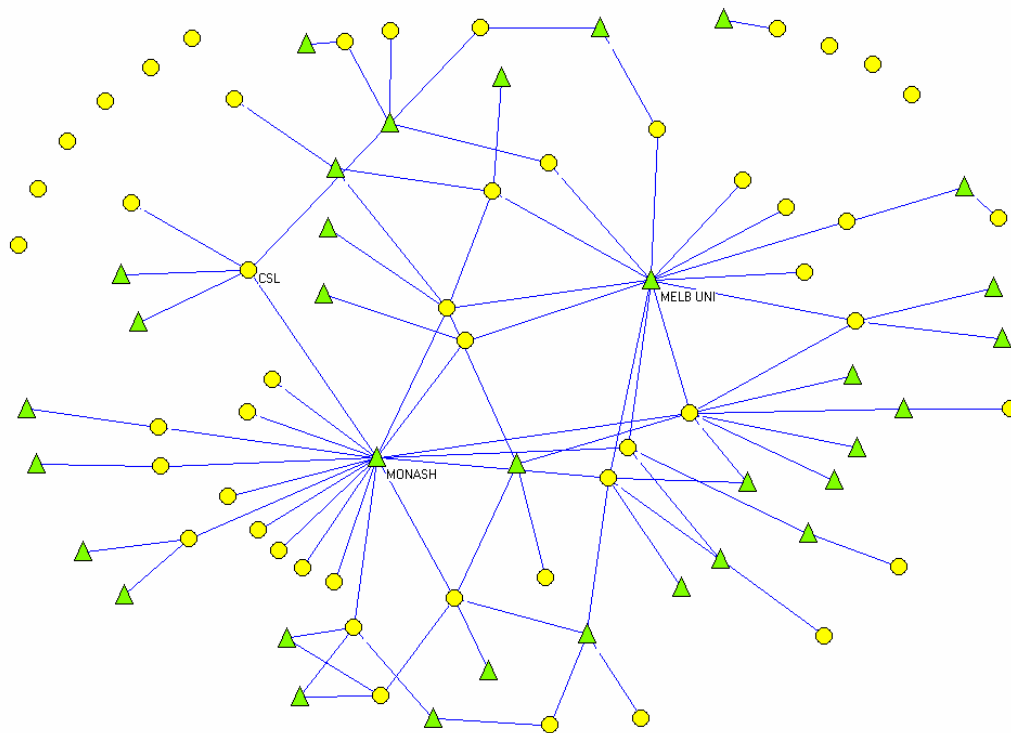
**Figure 1** Melbourne-based DBFs (yellow circles) and their partnerships with other Melbourne-based organisations (green triangles = public research organisations, red squares = financial firms, blue triangles = government institutes, white diamonds = other biomedical companies, orange diamonds = other)

The Melbourne biotechnology network was not forged through collaborations among DBFs. Of the 52 DBFs, only eight had agreements among themselves (fig. 2). As one CEO observed, ‘All the technologies are actually quite independent of each other, or seem to be, and certainly our technology is independent of others, and we don’t have a lot of association with other biotechnology companies.’ By implication, the Melbourne network was forged through intermediary organisations.



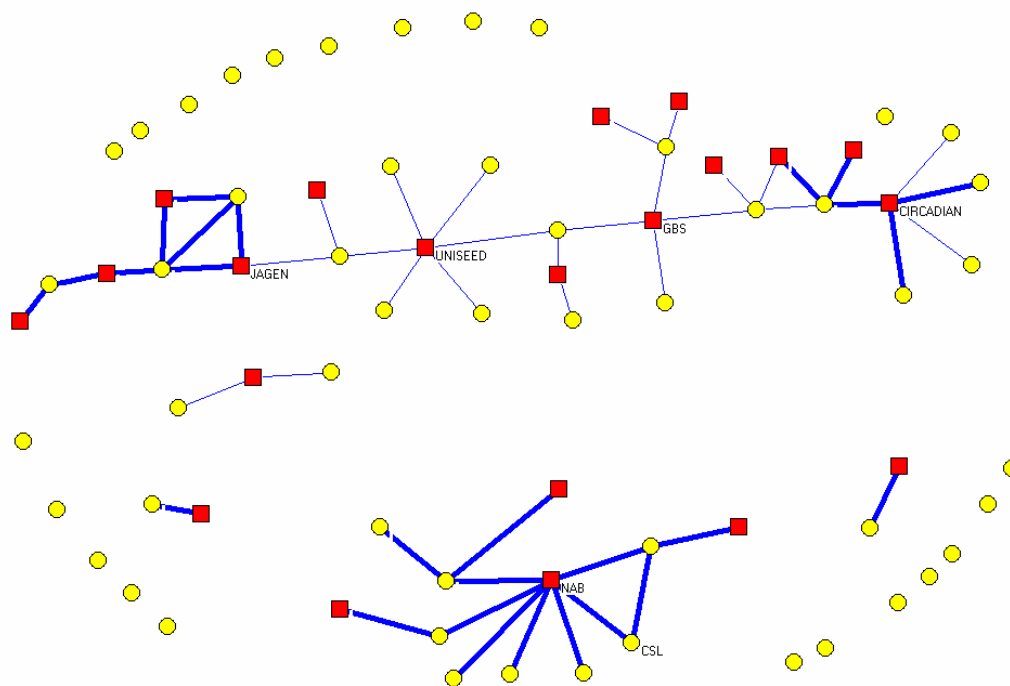
**Figure 2** Melbourne-based DBFs (yellow circles) and their partnerships with each other.

Above all, the Melbourne biotechnology network was forged through agreements with public research organisations. The 52 DBFs had formal collaborations with 34 Melbourne-based public research organisations. These collaborations arose from the invention of the technology in the first place, or its development. Consider, for the moment, these collaborations on their own. Of the 52 DBFs, 43 (83 per cent) had links with public research organisations, of which 42 (81 per cent) belonged to the main component of the network diagram configured through *Pajek* (fig. 3).



**Figure 3:** Melbourne-based DBFs (yellow circles) and their partnerships with Melbourne-based public research organisations (green triangles).

Collaborations with financial firms were less important in the Melbourne biotechnology network, but still significant. The 52 DBFs had ownership ties with 21 Melbourne-based financial entities. Again, consider these collaborations on their own. Of the 52 DBFs, 27 (53 per cent) had ties with financial entities. When configured though *Pajek*, 18 (35 per cent) formed one component and seven (13 per cent) formed another (fig. 4).



**Figure 4:** Melbourne-based DBFs (yellow circles) and their partnerships with Melbourne-based financial firms (red squares). Thick lines = ties with public companies; thin lines = ties with private companies.

The larger component is knitted together by four venture capital firms: Jagen, Uniseed, GBS and Circadian. These firms are diverse. Uniseed is a university based venture capital fund. Jagen is a private investment firm owned by a wealthy Melbourne family. GBS is an owner-managed life sciences funds management firm, bought from the London-based Rothschild group. Circadian is a public company that provides funds and management to early stage projects before spinning them out. It is similar in form to new financial conceptions of the firm described by Powell in the extended quote earlier in this paper. GBS and Uniseed invest only in unlisted companies (represented by thin lines in the diagram); Jagen invests in private and public companies (the latter represented by the thick lines); and Circadian turns private companies into public companies.

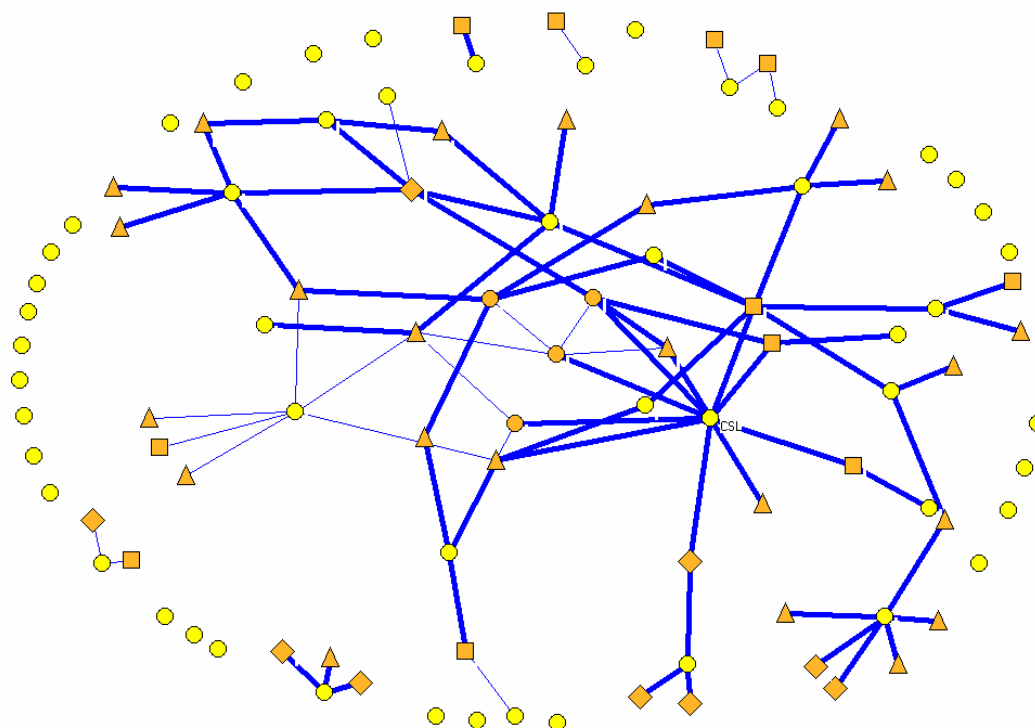
The other component is entirely formed through investments in public companies, and is knitted together by an investment arm of the National Australia Bank (NAB). NAB does not appear to have a dedicated life sciences fund. In other words, this other component apparently reflects institutional investment in public companies generally.



## The Interstate Network

Of the 52 Melbourne-based DBFs, only 25 (48 per cent) had interstate collaborations (82 of them). These 25 DBFs included 17 of the 19 listed Melbourne-based DBFs. In other words, it is overwhelmingly the largest Melbourne-based DBFs which forge interstate collaborations. This is reflected in the preponderance of thick lines (representing ties with public companies) in the network visualisation of interstate collaborations below (fig. 5).

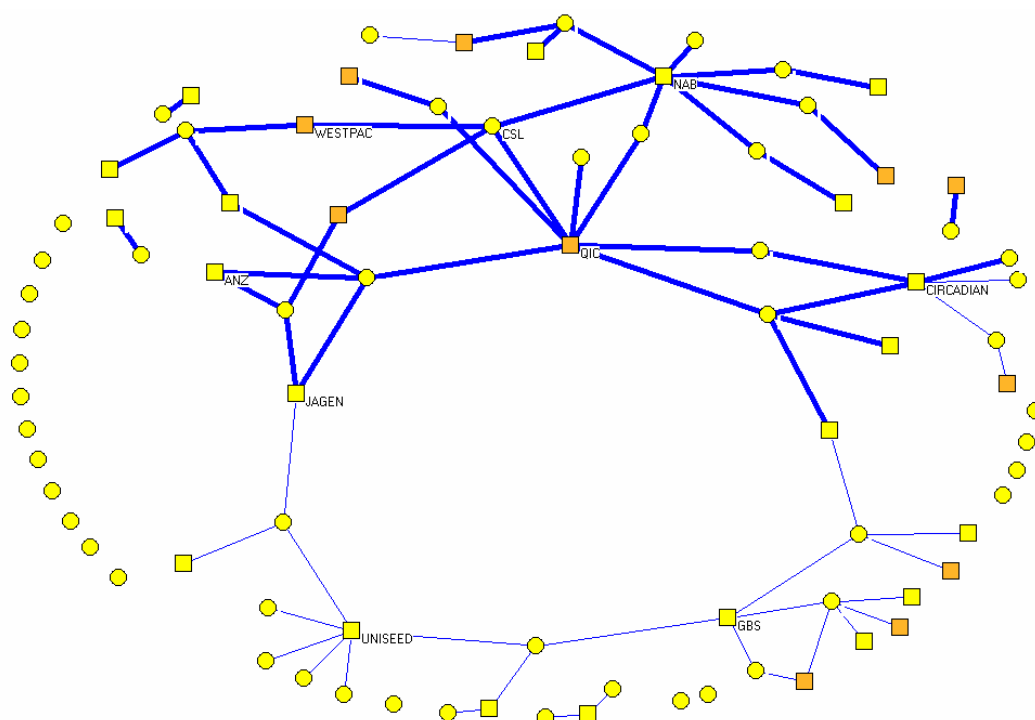
The 47 partner organisations were all based in capital cities, mostly Sydney (18) and Brisbane (14). As was the case for the Melbourne Cluster, most of them were public research organisations (23) or financial firms (11). When interstate collaborations are configured as a network, 19 DBFs (37 per cent) belong to the main component (fig. 5).



**Figure 5:** Melbourne-based DBFs (yellow circles) and their partnerships with other organisations based in Australia. Legend: yellow = Melbourne based; orange = interstate; circles = DBF; triangles = PROs; squares = financial firms; diamonds = other. Thick lines = ties with public companies; thin lines = ties with private companies.

Interstate partner organisations knit together a much larger financial network than Melbourne-based organisations on their own. Once all collaborations with Australian financial entities are configured through Pajek, the majority of Melbourne-based

DBFs (28, or 54 per cent) become a single component (fig. 6). The key ‘linker’ here is the Queensland Investment Corporation, a government-owned funds manager for corporate and institutional investments (such as superannuation funds) with a dedicated life sciences fund. QIC not only had ties with eight listed Melbourne-based DBFs (more than any other financial entity); it also linked the two components of the Melbourne network of DBFs and financial firms. At the same time, its investments were exclusively in public companies (represented by the thick lines in the *Pajek* diagram). In other words, its strategy – at least in relation to Melbourne DBFs - was an elaboration of the National Bank’s institutional investment strategy, rather than one of venture capital investment.

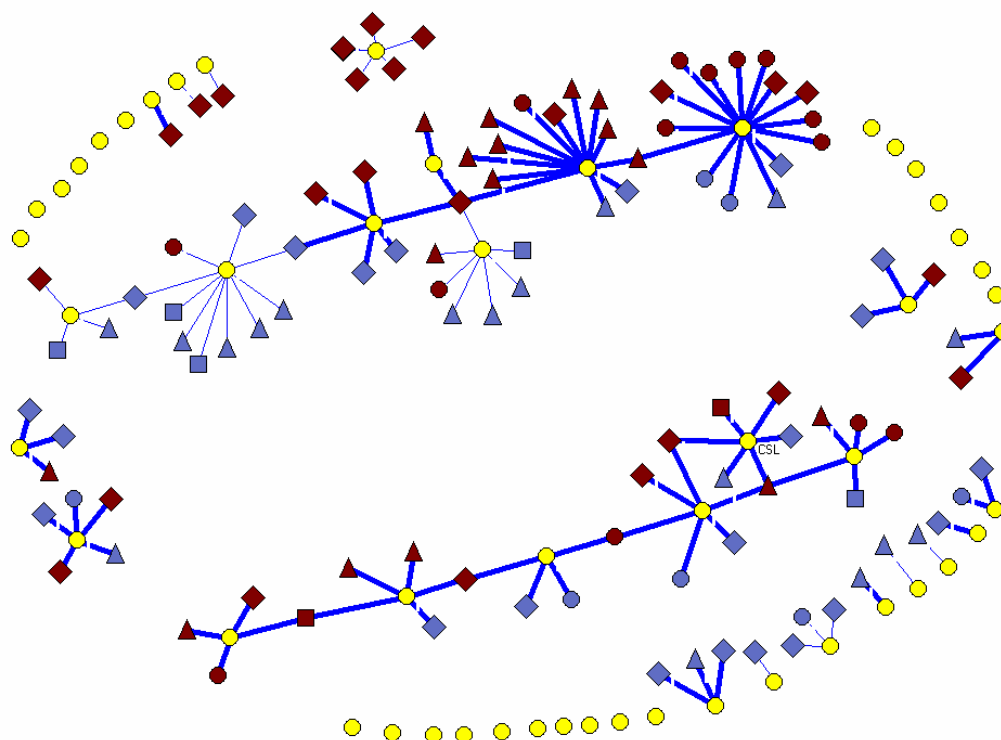


**Figure 6:** Melbourne-based DBFs (yellow circles) and their partnerships with Melbourne-based financial firms (yellow squares) and interstate financial firms (orange squares). Thick lines = ties with public companies; thin lines = ties with private companies.

### The International Network

Of the 52 Melbourne-based DBFs, 29 (56 per cent) had 122 collaborations with 111 international organisations. These 29 DBFs include all 19 listed DBFs, reflecting the fact that the biggest firms were most likely to forge external collaborations, whether interstate or international. Again, this is reflected in the preponderance of thick lines in the network visualisation of international collaborations (fig. 7).

The fact that so many international collaborations are spread across so many organisations means that when they are configured through Pajek, they do not amount to much of a network (fig. 7). Indeed, only nine international organisations (seven based in the US, two in the EU) are ‘linking organisations’ in the sense that they link together two or more Melbourne-based DBFs. Of these, only two organisations (both US based) have three or more links. On this account, the main component includes only seven Melbourne-based DBFs (13 per cent).



**Figure 7:** Melbourne-based DBFs (yellow circles) and their partnerships with international organisations. Legend: yellow = Melbourne based; brown = US based; purple = non-US international based; circles = DBF; triangles = PROs; squares = financial firms; diamonds = other. Thick lines = ties with public companies; thin lines = ties with private companies.

The international partner organisations with which Melbourne-based DBFs forged collaborations were very different to Australian partner organisations. Above all, DBFs forged international partnerships with private pharmaceutical, biomedical and biotechnology firms – all private firms directed towards commercialisation. Most notably, there were 19 pharmaceutical corporations among the international partner organisations (17 per cent of the total), whereas there were none among Melbourne or interstate partner organisations. Public research organisations still made up about one-quarter of international partner organisations, but they were less important in relative terms – in Australia they made up about one-half of partner organisations.

In contrast, financial firms barely featured among international partnerships. There were only six of them among the 111 international partner organisations. Even here, the active agents in three of these partnerships were local branch offices, not international headquarters. In other words, Melbourne-based DBFs forged international partnerships for commercialisation and R&D ends, but not for investment capital.

### **Network forms of organisation**

Network analysis indicates that DBFs far from the major world biotechnology clusters – at least those in Melbourne, Australia – depend upon a ‘distant networking’ strategy in relation to commercial partnerships and, to a lesser extent, research and development partnerships. They do not depend upon a distant networking strategy for venture capital (contrary to Thorburn’s argument). Like DBFs in the major clusters, they depend upon regional financing – both from local and interstate financial entities.

Key informants identified at least two dynamics underpinning regional financing. The first is local knowledge. The CEO of a local venture capital firm described how he usually identified investments ‘through a network and going to conferences and going on tours of universities and talking with chief transfer officers and all that sort of stuff’. More than this: once the investment was made, it required sustained involvement:

Starting these little companies ... it’s really, really hard. And very risky, and takes a huge amount of work ... You’ve got to stay with these companies for five years. You’ve got to coddle them and hold their hand, and you can often have huge fights with the other investors, and it’s really a long-term sort of thing where you have to get very involved with it.

The second dynamic is convenience. The same CEO – who had worked in the US industry - observed that in the US ‘most VCs in business for any sort of time will only invest where they don’t have to go overnight to go to a board meeting’. For the same reason his firm invested ‘up and down the east coast’ of Australia ‘because we can go to a board meeting and back, or to a due diligence visit and back, and sleep in your own bed’.

By implication, the emerging body of research on ‘out-cluster’ biotechnology firms places too much emphasis upon ‘precocious internationalization’ and ‘distant networking’ at the expense of regional clusters and networks, at least in relation to

venture capital and financial ties. As is the case in the major world clusters, local knowledge and convenience lead venture capitalists to invest in local biotechnology firms. In turn, their investments promote experimentation with new financial conceptions of the firm and, more generally, network forms of organisation.

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