
3 Measurement of investment in intangibles

This chapter outlines the data sources and development of Australian estimates of investment in the range of intangibles described in chapter 2. The estimates are for the market sector of the Australian economy, the sector of the economy for which Australian multifactor productivity (MFP) estimates are available.¹

As outlined in chapter 2, a number of steps and measurement challenges are involved in estimating investment in each intangible:

- find relevant data sources for expenditure on each intangible
- compile a time series of nominal expenditure
- determine the share of expenditure that is to be treated as investment
- select appropriate deflator and deflate to get a real investment series.

These steps, and the difficulties encountered in implementing them, are discussed in the following sections and the estimated real investment series presented. (A more detailed description of the method, data limitations and the comparability with other studies is provided in appendix A. The sensitivity of the real investment estimates to some of the assumptions is discussed in appendix D.)

Table 3.1 summarises the data sources and assumptions used to construct the real investment estimates for each of the intangibles. In most cases, the measures follow Corrado, Hulten and Sichel (CHS 2005) in order to facilitate international comparisons, with some improvements as incorporated in Marrano, Haskel and Wallis (MHW 2007). The exceptions are where Australian Bureau of Statistics (ABS) measures are available — computer software, artistic originals and mineral exploration.

¹ See table A.1 for a list of the twelve industry Australian and New Zealand Standard Industrial Classification (ANZSIC) divisions that make up the market sector. The industries excluded are Property & business services, Government administration & defence, Education, Health & community services, and Personal & other services. These industries are excluded because of the difficulties of measuring outputs in some service industries. The sector of the economy for which intangibles and MFP have been estimated varies across countries — this is discussed in chapter 6.

Table 3.1 Summary of data sources and assumptions used to construct investment of intangibles

<i>Type of intangible</i>	<i>Expenditure measure and main data sources^a</i>	<i>Proportion of expenditure treated as investment^b</i>	<i>Deflator</i>
Computerised information			
Computer software	Software investment by market sector industries ABS national accounts (Cat. no. 5204.0)	1	ABS computer software implicit price deflator (IPD)
Computer databases	Included in software estimates		
Innovative property			
Business expenditure on R&D (BERD)	Business R&D expenditure by market sector industries ABS BERD survey (Cat. no. 8104.0)	1	Implied market sector gross value added (GVA) deflator
Mineral exploration	ABS national accounts (Cat. no. 5204.0)	1	ABS mineral exploration IPD
Artistic originals	ABS national accounts (Cat. no. 5204.0)	1	ABS artistic originals IPD
Other product development, design and research			
New product development in financial industry	20 per cent of all intermediate purchases by Finance industry ABS Input-Output/Supply-Use (IO/SU) tables (Cat. no. 5215.0/unpublished)	1	Implied Finance & insurance industry GVA deflator
New architectural and engineering designs	50 per cent of sales of architectural and consulting engineering services to market sector industries ABS Industry survey (Cat. no. 8155.0) and ABS IO/SU tables (Cat. no. 5215.0/unpublished)	1	Implied market sector GVA deflator
R&D in social sciences and humanities	Included in BERD estimates		
Economic competencies			
Brand equity Advertising	Market sector share of total advertising expenditure less expenditure on classifieds and directories. Doubled to account for production costs. Commercial Economic Advisory Service of Australia advertising expenditure survey and ABS IO/SU tables (Cat. no. 5215.0/unpublished)	0.6	Implied market sector GVA deflator

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Table 3.1 (continued)

<i>Type of intangible</i>	<i>Expenditure measure and main data sources^a</i>	<i>Proportion of expenditure treated as investment</i>	<i>Deflator</i>
Market research	Sales of market research services to market sector industries. Doubled to account for own-account market research. ABS Industry surveys (Cat. nos 8155.0, 8677.0) and ABS IO/SU tables (Cat. no. 5215.0/unpublished)	0.6	Implied market sector GVA deflator
Firm-specific human capital	Direct costs and wage costs of employee time in training for market sector industries (excluding Agriculture). ABS Training surveys (Cat. nos 6353.0, 6278.0)	1	Average weekly full-time ordinary earnings deflator
Organisational capital Purchased	Sales of management consulting services to market sector industries. Assumed to be 77 per cent of sales of all business management services to market sector industries. ABS Industry survey (Cat. no. 8155.0) and ABS IO/SU tables (Cat. no. 5215.0/unpublished)	0.8	Implied market sector GVA deflator
Own account	20 per cent of salaries of Managers & administrators (excluding farm managers and IT managers) in market sector industries. ABS Labour Force Survey (Cat. no. 6310.0)	1	Implied market sector GVA deflator

^a Full details of data sources are provided in appendix A. ^b As used in CHS (2005, 2006). Basis for assumptions discussed in appendix A and sensitivity testing of some of these assumptions reported in appendix D.

3.1 Nominal expenditure series

For each of the intangibles an expenditure series was compiled for 1974-75 to 2005-06 — which in most cases required backcasting based on related data.

Computerised information

As noted in chapter 2, computer software is already treated as investment in the Australian national accounts. This covers both purchased and own-account software and database development — although databases and own-account software

development are only included if the expenditure is ‘large’ (ABS 2000, p. 452). The ABS estimates for this intangible asset are used in this paper — time series for gross fixed capital formation and capital stock are available for the full period 1974-75 to 2005-06.

This is broadly similar to the combination of the measures of computer software and computerised databases used in CHS (2005), although the ABS measure may understate this intangible through the exclusion of some database and own-account software development (see appendix A).

Innovative property

CHS include six types of innovative property — scientific R&D, mineral exploration, copyright and licence costs, new product development costs in the financial industry, new architectural and engineering designs, and R&D in social sciences and humanities. Differences in the collection and capitalisation of some of these expenditures by the ABS means there are some differences in the categorisation of these intangibles in this paper.

Business expenditure on R&D

Australian business expenditure on R&D (BERD) is available from ABS *Research and Experimental Development, Businesses* (Cat. no. 8104.0). A consistent series for the *market sector* (excluding Agriculture, forestry & fishing²) was compiled for 1968-69 to 2002-03 by Shanks and Zheng (2006). For this paper it was updated and extended to 2005-06 using revised and updated data from the ABS Cat. no. 8104.0.³

R&D activity is defined by the ABS as

Creative work undertaken on a systematic basis, in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. (ABS Cat. no. 8104.0, 2005-06, p. 30)

Unlike the US survey of industrial R&D, the ABS survey of BERD includes R&D in fields classed as social sciences and humanities (identified as a separate category of intangible in CHS 2005). A separate consistent time series for this subset of R&D was not readily available for Australia. Therefore, in this paper, the intangible

² The ABS did not directly survey farms and other businesses in this industry until 2005-06. Agriculture has been excluded from the 2005-06 data to maintain comparability over time.

³ The series used is total expenditure on R&D, not just current expenditure. This means that there is some double counting of capital expenditure, as was also the case in the UK study. However, capital expenditure was only 6 per cent of total Australian BERD in 2005-06.

category ‘business expenditure on R&D’ includes ‘R&D in social sciences and humanities’ as well as scientific R&D undertaken by market sector industries.

It should also be noted that the ABS BERD data include some R&D related to financial services and architectural/engineering services. It appears that the scope of these types of R&D as discussed in CHS (2005) is broader than those activities that may be covered by the BERD survey (although few details are given in CHS 2005). For comparability, the CHS method was used to estimate these separate types of R&D and the ABS-based BERD estimates were reduced to avoid double counting, where possible.⁴ The extent of any remaining duplication is discussed below.

Mineral exploration

Mineral exploration (the use of existing exploration techniques) is already capitalised in the Australian national accounts. The ABS estimates for this intangible asset are used in this paper — time series for gross fixed capital formation and capital stock are available for the full period 1974-75 to 2005-06.

This measure does not include mining R&D (the development of new exploration techniques and associated research) and therefore differs from that used in CHS (2005). In this paper, mining R&D is included in BERD because a separate consistent time series for mining R&D was not readily available.

Artistic originals

Artistic originals are already capitalised in the Australian national accounts. The ABS defines entertainment, literary or artistic originals as:

... originals of films, sound recordings, manuscripts, tapes, models, etc., on which drama performances, radio and television programming, musical performances, sporting events, literary and artistic output, etc., are recorded or embodied. (ABS 2000, p. 454)

This appears to be similar coverage to copyright and licence costs in CHS (2005). The ABS estimates are based on the present value of expected future income flows generated from the originals. The ABS uses a range of valuation techniques including the market transactions approach (for example, payment of advances to composers and authors) and the production cost approach (for example, the production costs of recorded music).⁵

⁴ An adjustment was made for financial services R&D but no adjustment was possible for architectural and engineering designs (see appendix A for details).

⁵ See ABS (2000, p. 38) for further details.

The ABS estimates for this intangible asset are used in this paper — time series for gross fixed capital formation and capital stock are available for the full period 1974-75 to 2005-06.

Other product development, design and research

CHS include ‘non-scientific’ R&D in the areas of new product development in the financial industry, new architectural and engineering designs and social sciences and humanities in this category of intangibles. As already discussed, R&D in social sciences is included in BERD in this paper.

New product development in the financial industry

CHS use a crude proxy for spending on new product development by the financial services industry of 20 per cent of total intermediate purchases by that industry.

The financial services industries of interest in the Australian context are a subset of ANZSIC Division K Finance & insurance — that is, Finance (ANZSIC 73) and a share of Services to finance and insurance (ANZSIC 75).

For this paper, a series for 20 per cent of total intermediate purchases⁶ by the financial services industries has been constructed from ABS data from input-output (IO) and supply-use (SU) tables. The share of Services to finance, investment and insurance is based on the output share of Finance in the combined output of Finance & insurance. This series covers the full period 1974-75 to 2005-06 — IO/SU data were not available for every year and missing years were interpolated/extrapolated (see appendix A for details).

This approach is taken for comparability with overseas studies, but the alternative of using only financial R&D expenditure as collected in the ABS BERD survey is examined as part of sensitivity testing (see appendix D).

⁶ No attempt has been made to specifically deduct purchases of intermediate inputs counted elsewhere in intangibles (particularly computer software). In line with CHS (2005), the percentage of intermediate purchases assumed to be product development (20 per cent) is conservative to account for this overlap.

New architectural and engineering designs

CHS estimate this intangible as half of the revenue of the architectural and engineering industries.

A time series for 50 per cent of the revenue of architectural and engineering industries was constructed for this paper using a number of data sources. The relevant industries for new designs are ANZSIC 7821 Architectural services and ANZSIC 7823 Consulting engineering. Data on revenue for ANZSIC industry classes are available from *Australian Industry* (ABS Cat. no. 8155.0) for the period 1998-99 to 2004-05.⁷

To backcast the aggregate series of architectural and engineering services to 1974-75, the growth rates for a related group of services from the product details of the ABS *Australian National Accounts: Input-Output Tables* (Cat. no. 5215.0) and unpublished SU tables were used — Architectural services, surveying and consulting engineering and Architectural services, surveying, consulting engineering and quantity surveying, respectively.

The resulting series for sales income for architectural and engineering design services was for the total economy. It was necessary to scale it down to the share relevant to the market sector. This was done using the market sector intermediate usage share of Australian production of Architectural, surveying, consulting engineering and quantity surveying services from the SU tables from 1994-95 to 2002-03. This share was backcast to 1974-75 (and forecast to 2005-06) using growth in the market sector share of gross value added.

On the issue of possible double counting with ABS BERD estimates, engineering and architectural R&D are amongst the fields covered by the ABS BERD survey. There are few details given in CHS (2005) as to the nature of the new architectural and engineering designs that make up this intangible asset in their study. However, it appears clear that the activities the authors have in mind fall outside what would ‘normally’ be considered architectural and engineering R&D — an example may be new designs using existing technology and methods — since their data source for ‘scientific R&D’ already includes engineering R&D in its scope.⁸ It is therefore assumed there is no issue of double counting between a CHS-type measure for Australia and activities covered above under the ABS BERD survey.

Some architectural and engineering services expenditure is already capitalised by the ABS — appearing as part of the tangible capital stock. However, these data are

⁷ The 2005-06 estimate was made assuming that growth rate for sales was the same as in 2004-05.

⁸ A similar conclusion was drawn in the UK study (see MH 2006, p. 4 for further discussion).

not available so it is not possible to compare this with the CHS-type estimate for Australia or make any adjustment for double counting (see appendix A for further discussion). The alternative of assuming that all relevant expenditure is already capitalised (that is, no additional architectural/engineering services expenditure is treated as investment) is examined as part of sensitivity testing (see appendix D).

Economic competencies

Economic competencies are defined by CHS (2005, p. 28) as the value of brand names and other knowledge-embedded firm-specific human and structural resources.

Brand equity

Spending on brand development is proxied by spending on advertising and market research. CHS suggest this includes the costs of launching new products, developing customer lists and maintaining brand equity and note that

Although advertising and market research are generally aimed at building a firm's market share at the expense of its competitors, such spending is necessary for developing new brands and maintaining the value of existing brands. (2005, p. 28)

Various rationales have been put forward for capitalising advertising and marketing expenditure — it may result in a positive image of the firm in the market and help to secure future orders (De and Dutta 2007); and it may establish a reputation for quality or educate consumers about the existence of new goods (Nakamura 1999, p. 6). A reputation for reliability may persuade shoppers to try a new item for the first time.

Advertising

CHS estimate this intangible using expenditure data published by a US advertising association.

Australian advertising expenditure for 1975 to 2006 is available from an annual survey of the industry conducted by Commercial Economic Advisory Service of Australia (CEASA 2003, 2006, 2007). This is a similar type of data source to that used in CHS (2005), except that it includes only media costs for time and space and excludes production costs. Based on data for the United States and United Kingdom about the proportion of production costs in total advertising costs (see appendix A), the CEASA series has been doubled to account for production costs.

These estimates for the total Australian economy have been scaled down to market sector estimates using market sector intermediate usage as a share of Australian production of advertising services from the ABS SU tables for 1994-95 to 2003-04. This share was backcast to 1974-75 (and forecast to 2005-06) using growth in the market sector share of gross value added.

Market research

CHS estimate this intangible as twice the revenue of the market and consumer research industry. Industry revenue is doubled to allow for firm's own account spending on market research.

A time series of twice the revenue⁹ of the market research industry was constructed for this paper using a number of data sources. The relevant industry is ANZSIC 7853 Market research services. Data on revenue for ANZSIC industry classes are available from *Australian Industry* (ABS Cat. no. 8155.0) for 1998-99 to 2004-05.¹⁰ An irregular survey, *Selected Business Services, 1992-93* (ABS Cat. no. 8677.0) provided similar data for 1992-93. The estimates for the missing years were interpolated by simple averages.

This series of market research services was backcast from 1992-93 to 1974-75 using the growth in Market and business consultancy services from the product details of the ABS IO tables (Cat. no. 5215.0).

The resulting series was for the total economy. It was necessary to scale it down to the share relevant to market sector intermediate usage using data on the closest available group of services (Other business services) from SU tables for 1994-95 to 2003-04. This share was backcast to 1974-75 (and forecast to 2005-06) using growth in the market sector share of gross value added.

Firm-specific human capital

CHS (2005, p. 29) suggest that spending on firm-specific human capital can be measured by the costs of employer-provided workforce training. Spending on workforce training consists of two types of expenses:

- direct firm expenses (outlays on inhouse and external training courses)
- wage and salary costs of employee time spent in informal and formal training.

⁹ The CHS approach was followed for comparability purposes and in the absence of readily available alternative estimates of inhouse market research.

¹⁰ The 2005-06 estimate was made assuming that the growth rate for sales was the same as in 2004-05.

There are two aspects of the scope of the measure of firm-specific human capital used in this paper that should be noted.

- All employer-provided structured training is included.
 - There is a question as to how much of this training is firm-specific and not transferable.¹¹ Richardson (2004, p. 29) notes that it is standard to argue that in a competitive labour market there will be no benefit to firms from providing general training so firms will only provide firm-specific training.¹² On that basis it could be assumed that all employer-provided training is firm specific. However, in practice most training is neither wholly general nor firm specific. It has not been possible to examine this issue in detail in this paper or adjust the measure of firm-specific human capital.
- This is not a measure of total human capital.
 - It does not include education and unstructured on-the-job training. However, to some extent these broader elements of human capital are incorporated into the growth accounting exercise in chapters 5 and 6 through use of the ABS experimental quality-adjusted labour input series.¹³
 - Related to this is an issue of double counting. Fukao et al. (2008a) note
If workers gain non-firm-specific skills from [employer provided] off-the-job training, such accumulation of human capital will be reflected in their wage rates. Since in standard growth accounting wage increases by age are already taken into account as improvements in labor quality, there is a risk of double counting [in capitalising off-the-job training costs incurred by employers]

Again, it has not been possible to make any adjustment for this potential double counting.

It has been acknowledged by a number of researchers in this area that employer-provided training in Australia is poorly measured (see, for example, Cully 2005 and Richardson 2004), particularly prior to 1990 (Smith 1999). No single data source provides a time series of Australian employer-provided training expenditure. To construct a series, several different sources were used, together with a number of

¹¹ ABS Cat. no. 6278.0 (2005, p. 48) defines skills gained through the completion of a training course as transferable if they could be used in a similar job with another employer. It estimated that 90 per cent of reported work-related training courses completed by employees were considered by the employees as providing skills that were transferable. However, it was also the case that employees considered that 93 per cent of this training had not helped them gain a pay rise or promotion.

¹² For a discussion of the economics of general versus firm-specific training see Borland (1990).

¹³ For ABS estimates of the human capital stock based on education and work experience see Wei (2008).

assumptions. The resulting series is therefore only broadly indicative and trends in it should be interpreted with caution.

The ABS *Employer Training Expenditure, Australia* (Cat. no. 6353.0), an employer survey, measured both direct costs and wage and salary costs for the total economy (excluding agriculture) for 1989, 1990, 1993 and 1996. The ABS also estimated this measure for 2001-02 based on data from *Employer Training Expenditure and Practices* (Cat. no. 6362.0) and *Education and Training Experience* (Cat. no. 6278.0) (NCETS 2004). Specifically the measure includes

The sum of employers' expenditure for employees gross wages and salaries for time receiving and providing structured training, fees paid to consultants and institutions and other expenditure on structured training. (ABS Cat. no. 6353.0, 1996, p. 46)

where structured training is defined as

all training activities which have a predetermined plan and format designed to develop employment-related skills and competencies. It consists of periods of instruction, or a combination of instruction and monitored practical work. (ABS Cat. no. 6353.0, 1996, p. 45)

For 1993-94 and 1996-97 the expenditure data were available by industry, enabling the construction of a market sector (excluding Agriculture) estimate. For 1989-90 and 1990-91, the market sector estimate was derived by using growth in expenditure for the whole economy. For 2001-02 the market sector estimate was derived by using total economy growth in expenditure between 1996-97 and 2001-02, adjusted for the fall in market sector share of total hours of training from ABS *Education and Training Experience, Australia* (Cat. no. 6278.0).

To backcast the expenditure series to 1974-75 it was necessary to use growth in a related series. No ideal series was available. However, it was possible to construct an approximate series for total training hours for the market sector (excluding Agriculture).¹⁴ This was combined with an approximate series for real expenditure per training hour¹⁵ to derive total training expenditure for the market sector.

¹⁴ This was based on data for training hours per employee from ABS Cat. nos 6353.0 and 6278.0 and the number of employees from the Labour Force Survey (see appendix A). A constant number of training hours per employee was assumed from 1974-75 to 1989-90. This is a very crude assumption. However, this assumption is made for transparency in the absence of sufficient data to fit a trendline. (During the period for which there are data available there are breaks in series created by the introduction of the Training Guarantee in 1990-91, its suspension in 1994-95 and abolition in 1996-97.)

¹⁵ Expenditure per training hour was available for 1989-90, 1990-91, 1993-94, 1996-97 from ABS Cat. no. 6353.0 and derived for 2001-02 from NCETS (2004) and ABS Cat. no. 6278.0. These data were deflated by growth in average weekly earnings to obtain a real cost series. In the absence of any specific information on changes in real costs, real cost per hour was interpolated

No adjustment was made to account for training in the agriculture industry, which would lead to an understatement of expenditure by the market sector on firm-specific human capital. However, in general, the firm-specific human capital series should be viewed as being affected by a number of measurement errors that could lead to understatement or overstatement of the true level. (For example, the use of constant training hours per employee at either end of the series may have biased the estimates). Additional data and/or more sophisticated estimation techniques would be required to make more definitive statements about the size and direction of change in firm-specific human capital investment. This exercise was beyond the scope of this paper.

Organisational capital

This intangible, along with firm-specific human capital, is particularly difficult to estimate. However, CHS note that the importance of organisational capital requires its treatment as an investment for consistency with other assets. They also cite micro data evidence that firm level differences in organisational practices are strongly related to productivity (CHS 2006, pp. 18–9).

Marrano and Haskel (MH 2006, p. 11) liken the measurement problem of establishing a volume of organisational capital from observed expenditure to that of establishing the volume of R&D knowledge capital from observed expenditure on R&D. An additional problem is that expenditure on organisational capital can be unobserved.

CHS (2005, p. 29) suggest that investment in organisational capital is made up of two components

- purchased — such as management consultant fees
- own account — measured in terms of the value of executive time spent on improving the effectiveness of business organisations (that is, time spent on developing business models and corporate cultures).

CHS note that there is some overlap between these measures of organisational capital and some other intangibles

Consulting expenditure and the estimated value of executive time conceptually overlap by a small amount (the value of executive time in the management consulting industry). In addition, some portion of management time arguably overlaps with R&D, so that, for some industries, the line between industry-specific process innovation and organizational change more generally may not be easily drawn. But, whatever uncertainty the amount induces in our estimates, it is dwarfed by the use of an arbitrary

between the actual data points and an exponential trend was fitted to estimate growth before 1989-90 and from 2001-02 (see appendix A).

fraction for the amount of executive time devoted to organizational change and development. (2005, pp. 29–30)

MH (2006, p. 12) also suggest some overlap with IT consulting and software investment. They also note that some expenditure on management consultants is to deal with short term problems (for example, closing down businesses and discharging employees).

Purchased

CHS estimate this intangible from the revenue of the management consulting industry. Data for the revenue of the Australian management consulting industry is very limited. A time series was constructed for this paper from the few available data sources for the closest relevant industry, ANZSIC 7855 Business management services. This is broader than just management consultancy — for example, it includes public relations consultancies (which are excluded from the UK and US studies). Therefore only 77 per cent of this industry revenue was included, as a crude adjustment for some of this difference in scope.¹⁶

Data on revenue for ANZSIC industry classes are available from *Australian Industry* (ABS Cat. no. 8155.0) for 1998-99 to 2004-05.¹⁷ The series for business management services was backcast from 1998-99 to 1974-75 using the growth in Market and business consultancy services from the product details of the ABS IO tables (Cat. no. 5215.0).

The resulting series for sales income for business management services was for the total economy. It was necessary to scale it down to the share relevant to market sector intermediate usage using data on the closest available group of services (Other business services) from SU tables from 1994-95 to 2003-04. This share was backcast to 1974-75 (and forecast to 2005-06) using growth in the market sector share of gross value added.

¹⁶ There is very limited information about the size of the public relations segment of this industry in 1992-93 and it is assumed that the public relation share is constant over the full time series. It has not been possible to adjust for other differences in scope, such as the inclusion in Australian estimates of environmental consultancies, and this may lead to an overstatement of organisational capital compared with the studies of other countries (see appendix A for further details). This is examined as part of sensitivity testing in appendix D.

¹⁷ The 2005-06 estimate was made assuming that the growth rate for sales was the same as in 2004-05.

Own account

CHS estimate the own-account component of organisational capital as 20 per cent of the value of executive time using BLS data on employment and wages in executive occupations. MH (2006, p. 13) use a similar approach but excludes ICT managers (to avoid double counting with capitalised software) and the self-employed (who they indicate do not build organisational capital in the same way as in other industries). The definition of managers appears to be relatively broad (not just, for example, CEOs).

The own account portion of organisational capital for Australia was estimated from average earnings of managers and the number of managers in the market sector. The specific occupation group used is Managers & administrators¹⁸ excluding, where possible, both IT managers and Farmers & farm managers. The exclusion of IT managers is based on the reasoning used by MH (2006) — avoiding double counting with IT capital. Farmers & farm managers are excluded because this subgroup is considerably different from other managers and would not be expected to build organisational capital in the same way. The self-employed (owner-managers of unincorporated enterprises) are also excluded, as in MH (2006), because the relevant ABS survey did not cover this group.

Data on average weekly earnings and number of Managers & administrators were available from the *Employee Earnings, Benefits and Trade Union Membership* (EEBTUM) survey (ABS Cat. no. 6310.0). The average earnings are calculated excluding those employees who did not draw a wage or salary, that is, people working in their own incorporated enterprises.

Annual unpublished data on earnings and employee numbers from the EEBTUM survey are available for Managers & administrators, excluding IT managers and farmers, in the market sector from August 1997 to August 2006. The number of employees obtained includes persons who receive a wage or salary or persons who operate their own incorporated enterprises. Using this number of employees to obtain the wages bill implicitly assumes the value for own account organisational capital investment for owner-managers is equal to the average earnings of Managers & administrators drawing a wage or salary.

Prior to 1997 data are only available from the annual publication of the EEBTUM survey. This included the number of Managers & administrators for the total economy back to 1986 and average weekly earnings back to 1988. Prior to this, data

¹⁸ *Australian Standard Classification of Occupations, Second edition, 1997* (ABS Cat. no. 1222.0) has been used or the closest available occupation from earlier occupational classifications (see appendix A).

for full-time Managers & administrators in the total economy were available back to August 1975. Growth in average weekly earnings for these groups of Managers & administrators were used to backcast the market sector series from 1997 to 1975. For employee numbers the series for Managers & administrators excluding IT managers and farmers was backcast from 1997 to 1975 using growth in a market sector series constructed from Labour Force Survey data for employed Managers and administrators by industry.

The total wages bill was calculated as the number of employees multiplied by average weekly earnings multiplied by 52 weeks. As noted above, this number of employees excludes owner-managers of unincorporated enterprises. This may lead to an underestimate of own-account organisational capital if this group does invest in this intangible in the same way as other Managers & administrators.

Twenty per cent of this wages bill was counted as expenditure on own account organisational capital. CHS (2005, p. 30) note that the assumption that managers spend 20 per cent of their time investing in organisational development is arbitrary. However, for the purposes of comparability, and in the absence of alternative estimates of time spent, the same percentage is used in this paper.

3.2 How much of expenditure is investment

Column 3 of table 3.1 shows the proportion of current expenditure that is assumed to be investment, in line with CHS (2005). This approach is followed for international comparability and in the absence of estimates of the proportion of expenditure that should be treated as investment.¹⁹ For most intangibles 100 per cent of the expenditure estimate is included. There are two exceptions — brand equity and purchased organisational capital.

Brand equity

CHS (2005) exclude certain categories of advertising that are not considered to be reputation building and then assume 60 per cent of the remaining advertising expenditure and 60 per cent of market research expenditure is investment. This approach is followed in this paper.

There are two issues — does this expenditure build an asset and how long lived is it?

¹⁹ Sensitivity testing of the growth accounting results to investment size is reported in appendix D.

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- As already noted, the extent to which expenditure on advertising is building an asset rather than being consumed is a difficult question, which is not examined in detail in this paper. However, some types of ads are excluded altogether from other studies because they are not considered to be asset building at all.
 - The US study includes only national ads — the ‘local’ ads are considered to be promoting sales at specific stores rather than being aimed at selling specific products (CHS 2005, p. 33).
 - The UK study excludes classified ads — small personal ads by individuals or recruiting advertisements for vacancies to be filled in a relatively short time period (MH 2006, p. 8).
 - It was possible to exclude ‘Classifieds and directories’ from the Australian advertising expenditure series — a similar adjustment to the UK study.
 - Advertising or market research expenditures with a service life of less than one year are excluded as they are an expense not an investment.
 - CHS (2005, p. 32) note that, while the literature finds that the effects of advertising are generally short-lived, more than half has a service life of at least one year. From this they assume that 60 per cent of advertising and market research expenditures should be counted as investment.

Purchased organisational capital

CHS assume 80 per cent of spending on management consulting services relate to building organisational capital. The remainder is assumed to be related to be day-to-day advising on, for example, short-term personnel problems, which is assumed not to build organisational capital. This approach is followed in this paper, given the very limited available data about the Australian management consulting industry.

3.3 Deflators

Column 4 of table 3.1 shows the deflators used to convert nominal values for investment in intangibles into their real counterparts. As noted by CHS (2005, p. 36), this conversion is difficult because intangibles are often owner constructed or difficult to measure services with no available or reliable price deflator. In CHS (2006), the authors settle on the use of a pure output deflator (non-farm business output) as a proxy for the price of intangibles, while noting that this proxy is a ‘placeholder’ until further research develops deflators for specific intangibles.²⁰

²⁰ For a discussion of the relative merits of an output versus a wage deflator for this purpose see CHS (2006, pp. 14–5).

The equivalent deflator in the Australian context is the implied market sector gross value added (GVA) deflator, derived from the Australian national accounts.²¹ This deflator is used for all categories of intangible except for:

- computer software, mineral exploration and artistic originals — ABS real gross fixed capital formation series are available for these intangible assets (based on asset-specific implicit price deflators)²²
- financial product development — an implied Finance & insurance GVA deflator (derived from the Australian national accounts) was used. As discussed by MHW (2007, p. 15), the most relevant output deflator is the one for the output that presumably embodies the knowledge that the R&D is generating
- firm-specific human capital — in order to compile this series a wage deflator (derived from average weekly ordinary time earnings for full-time adults) was used to estimate real cost per hour of training. As this intangible mainly comprises wage costs the resulting estimates of firm-specific human capital in real terms were used as the real investment series.

3.4 Real investment series

Current intangible investment

Applying the measurement assumptions discussed above, it is estimated that market sector investment in intangibles was \$57 billion in 2005-06 (table 3.2). This was almost half the size of market sector investment in tangibles and nearly 10 per cent of adjusted market sector gross value added (including the investment in the intangibles).²³ Around 80 per cent of this investment was in the newer intangibles (that is, those not already treated as investment in the national accounts).

²¹ Australian MFP is measured for the market sector rather than the non-farm business sector used in the United States. The implied market sector GVA deflator is derived from the current price and chain volume series in the Australian national accounts.

²² See ABS (*Australian System of National Accounts*, Cat. no. 5204.0) for further details. MHW (2007) similarly use the software deflator from the UK Office of National Statistics.

²³ This is equivalent to about 6 per cent of conventionally-measured GDP (for the total economy not just the market sector), which includes software, mineral exploration and artistic originals but not the new intangibles.

Table 3.2 Nominal intangible investment, market sector, 2005-06

	2005-06	Share of investment	Share of adjusted market sector GVA ^a
	\$m	%	%
<i>Computerised information</i>	7 435	13.1	1.3
<i>Innovative property</i>	21 346	37.6	3.6
BERD	7 904	13.9	1.3
Mineral exploration	2 503	4.4	0.4
Artistic originals	698	1.2	0.1
Other product development, design and research	10 241	18.1	1.7
Financial product development	5 591	9.9	0.9
New arch./eng. designs	4 650	8.2	0.8
<i>Economic competencies</i>	27 942	49.3	4.7
Brand equity	8 444	14.9	1.4
Advertising	7 337	12.9	1.2
Market research	1 107	2.0	0.2
Firm-specific human capital	4 353	7.7	0.7
Organisational capital	15 146	26.7	2.6
Purchased org. capital	10 208	18.0	1.7
Own account org. capital	4 938	8.7	0.8
Total intangibles investment	56 724	100.0	9.6
New intangibles	46 088	25.0	7.8
National accounts intangibles	10 636	5.8	1.8
Tangibles	127 935	69.3	21.6
Total investment	184 659	100.0	31.2
Ratio intangible to tangible investment	0.44		
Ratio of existing to adjusted market GVA			0.92

^a Adjusted market sector gross value added is existing market sector GVA at basic prices plus market sector investment in new intangibles.

Source: Authors' estimates.

Total investment in intangibles in 2005-06 was made up as follows.

- The largest component was economic competencies (49 per cent).
 - Of this, more than half was organisational capital, about a third brand equity and about a sixth firm-specific human capital.

-
- Innovative property was the second largest group (38 per cent).
 - This was fairly evenly split between non-scientific R&D (other product development and artistic originals) and other R&D (BERD and mineral exploration).²⁴
 - Investment in computerised information (13 per cent) was around a third the size of that in innovative property.

Therefore investment in some of the newer intangibles was as large or larger than the more traditional intangibles:

- organisational capital was the largest individual component of investment in intangibles and twice the size of investment in computerised information
- investment in brand equity was similar in size to investment in computerised information and to BERD.

Growth in intangible investment

In real terms, total intangible investment in the market sector grew from just over \$9 billion in 1974-75 to \$57 billion in 2005-06 — an average annual growth rate of 6 per cent (figure 3.1). Real tangible investment increased from \$33 billion to \$128 billion over the same period — an average annual growth rate of 4.5 per cent.

Intangible investment increased in importance relative to tangible investment over this period — the ratio of intangible to tangible investment rising from 0.20 to 0.44 (in nominal terms)²⁵, having reached 0.54 in 2001-02 prior to the recent period of rapid growth in tangibles.

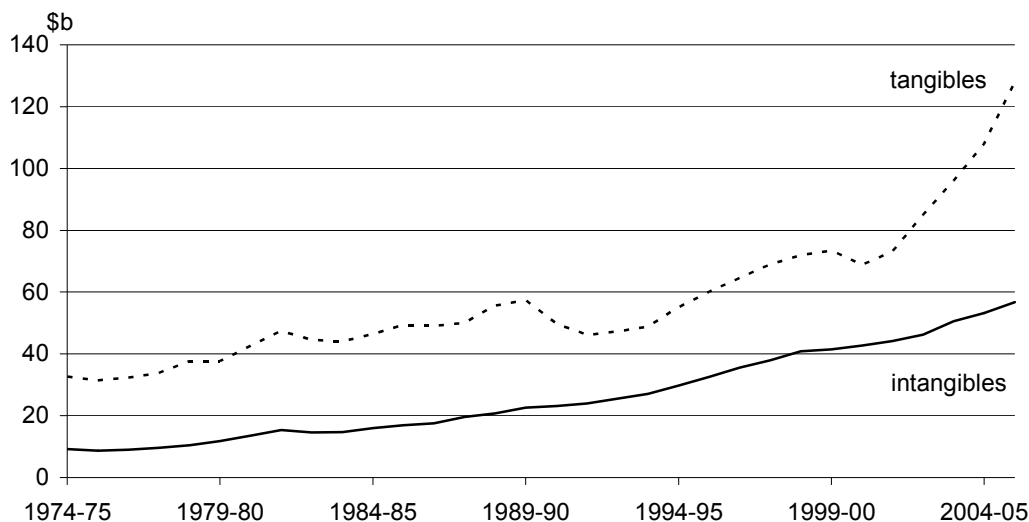
Capitalising all intangibles investment virtually removes the declining trend in the ratio of total investment to gross value added shown by ABS national accounts data (figure 3.2). ABS national accounts data (which include only a subset of intangibles as investment) show a declining trend in nominal total investment as share of market sector gross value added (bottom line). However, after including the ‘new’ intangibles as investment the trend is almost flat (top line). This trend is obviously sensitive to the assumptions used in estimating investment in the new intangibles (see appendix D for the variability of investment to these assumptions).

²⁴ However, due to data limitations BERD does include R&D in social sciences and humanities.

²⁵ In nominal terms, because of the non-additivity of real (chain volume) measures.

Figure 3.1 Real investment, tangibles and intangibles^a, market sector, 1974-75 to 2005-06

2005-06 dollars, chain volume measures

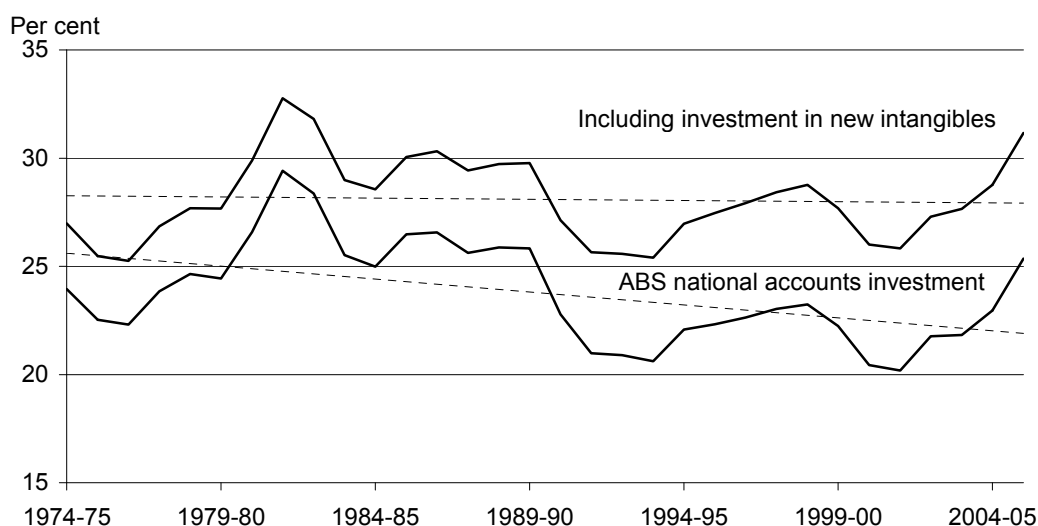


^a For sensitivity of intangibles investment to some of the assumptions in its compilation, see appendix D.

Data sources: Based on ABS national accounts data and authors' estimates.

Figure 3.2 Total investment shares of gross value added, 1974-75 to 2005-06

Percentage of market sector gross value added^a



^a For the top line, investment in all assets including 'new' intangibles as a share of adjusted market sector gross value added (existing market sector gross value added at basic prices plus market sector investment in new intangibles). For the bottom line, investment in all assets included in the ABS national accounts (only includes the intangibles software, mineral exploration and artistic originals) as a share of existing market sector gross value added at basic prices derived from the ABS national accounts. Both in nominal terms.

Data sources: Based on ABS national accounts data and authors' estimates.

Total investment in intangibles as a share of adjusted market sector gross value added is estimated to have risen from 4.5 per cent in 1974-75 to 9.6 per cent in 2005-06. This is an average growth rate in this share of 2.4 per cent a year — which is similar to the Webster (2000) estimate (derived using different methodology), although the share is quite different.

- Webster (2000) estimated that enterprise intangible investment as a ratio of all production rose by 2.8 per cent a year in the 25 years to 1996. Growth in the investment series in this paper over the closest comparable period (1974-75 to 1995-96) is very similar to this at 2.9 per cent a year.
- Webster (2000) proxied this investment ratio with the share of the labour force in occupations producing intangible capital — which was 11 per cent in 1971 and 22.1 per cent in 1996. The expenditure-based measures in this paper are less than half the size — about 5 per cent in 1974-75 and 8.5 per cent in 1995-96.

Growth in the level of intangibles investment has been fairly steady on average over the last three decades — 1974-75 to 1984-85, 1984-85 to 1994-95 and 1994-95 to 2005-06 — at 5.6, 6.4 and 6.0 per cent a year, respectively (table 3.3). This contrasts with tangible assets, for which average growth was around 4, 2, and 8 per cent a year in successive decades.

While average growth in total investment in intangibles has been fairly steady over the three decades, the trends across different types of intangibles have varied (table 3.3). Overall, the average rate of growth of investment in the national accounts intangibles has declined over successive periods (although the computerised information growth rate has remained the highest), while that of the new intangibles as a group rose between the first period and latter periods.

The fastest growing group within economic competencies shifted from brand equity in the first decade to organisational capital in subsequent periods. Growth in firm-specific human capital fluctuated but was relatively low in most periods. The growth rate of investment in BERD fluctuated but reached higher levels in the last decade than the first. The opposite was the case for other product development. Average growth in each of the components of innovative property was lower than that of organisational capital in the last period.

Table 3.3 Growth in real intangible investment^a, market sector

	1974-75 – 1984-85	1984-85 – 1994-95	1994-95 – 2005-06	1974-75 – 2005-06
	% per year	% per year	% per year	% per year
<i>Computerised information</i>	28.3	21.4	11.6	20.0
<i>Innovative property</i>	5.4	4.9	4.3	4.9
BERD	2.0	12.3	7.1	7.1
Mineral exploration	9.0	-1.2	1.2	2.8
Artistic originals	11.1	-3.1	6.4	4.7
Other product development, design and research	4.3	5.4	3.3	4.3
Financial product development	4.6	3.9	0.8	3.0
New arch./eng. designs	3.5	8.6	7.4	6.5
<i>Economic competencies</i>	4.4	4.4	5.5	4.8
Brand equity	5.6	1.5	2.9	3.3
Advertising	5.4	1.1	2.1	2.8
Market research	15.8	12.5	11.3	13.1
Firm-specific human capital	2.8	4.5	0.0	2.3
Organisational capital	3.4	9.9	10.2	7.9
Purchased org. capital	15.8	19.3	13.4	16.1
Own account org. capital	1.6	5.1	5.9	4.3
Total intangibles investment	5.6	6.4	6.0	6.0
New intangibles	4.2	5.5	5.3	5.0
National accounts intangibles	12.8	9.9	8.8	10.4
Tangibles	3.6	1.7	8.0	4.5
Total investment	4.0	2.9	7.3	4.8
	<i>Average nominal ratio</i>			
	1974-75 – 1984-85	1985-86 – 1994-95	1995-96 – 2005-06	1974-85 – 2005-06
Ratio intangible to tangible investment	0.23	0.34	0.48	0.35
Ratio of existing to adjusted market GVA	0.96	0.94	0.93	0.94

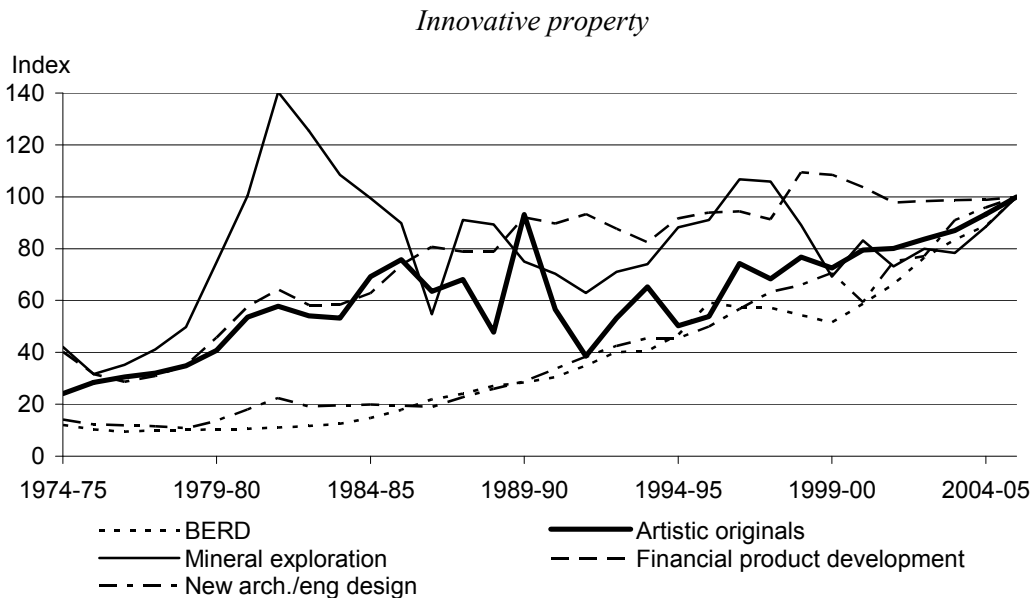
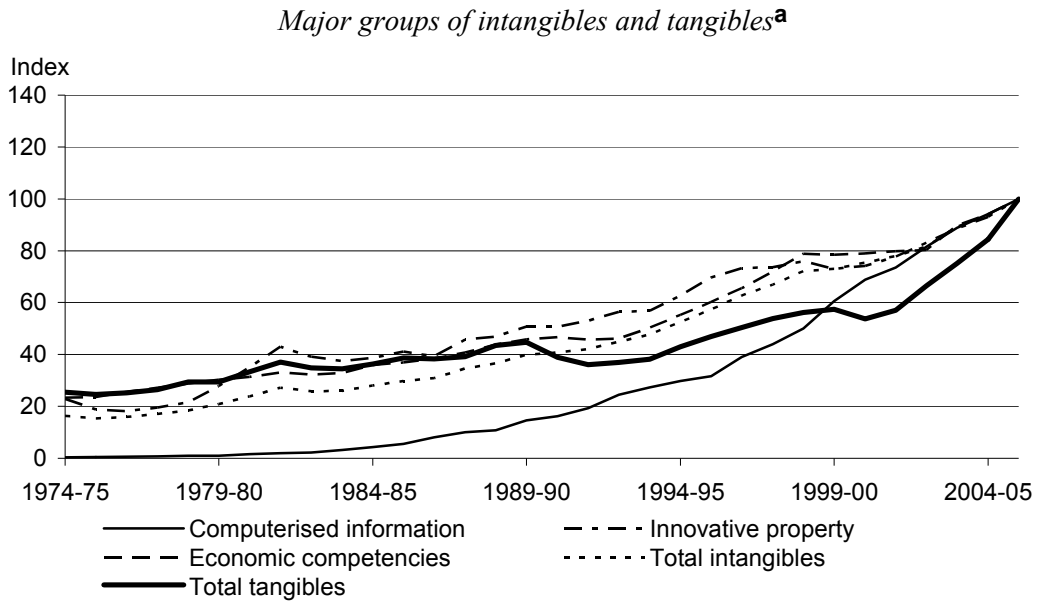
^a Growth rates are based on chain volume measures (CVMs) — ABS CVMs have been used for mineral exploration and artistic originals; an aggregate market sector CVM has been calculated for computerised information using ABS industry data; and CVMs have been calculated for all subtotals and totals.

Source: Authors' estimates.

For some intangibles growth in real investment was relatively volatile from year to year — particularly innovative property intangibles, such as mineral exploration, artistic originals and financial product development (figure 3.3).

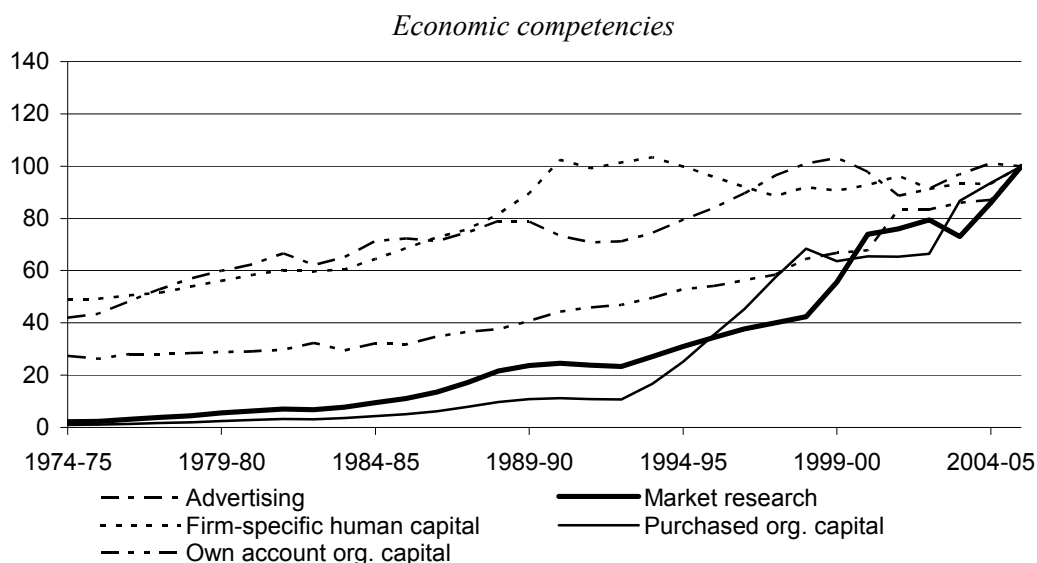
Figure 3.3 Real investment, by asset type, market sector, 1974-75 to 2005-06

Index 2005-06 = 100



(continued on next page)

Figure 3.3 (continued)

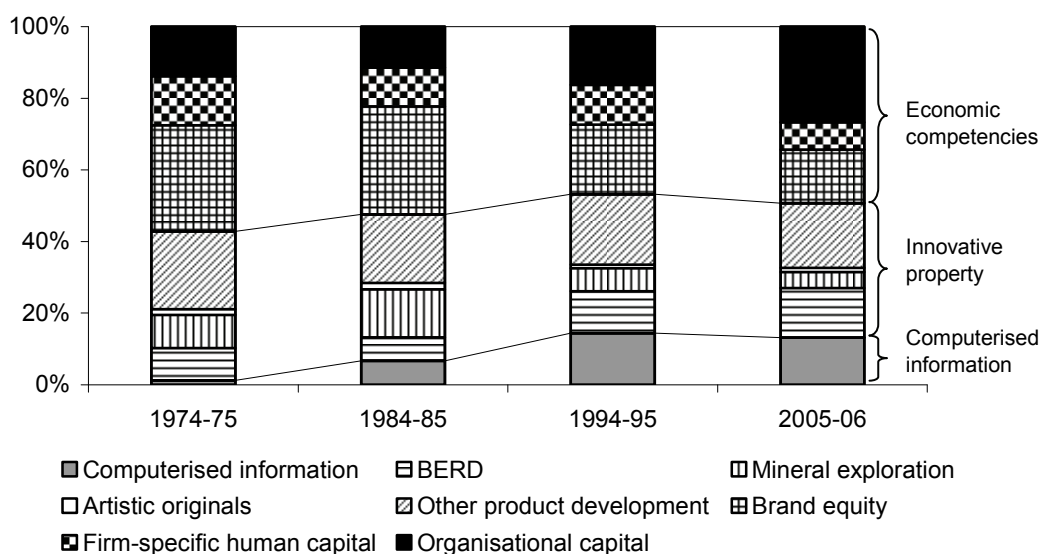


^a ABS CVMs have been used for mineral exploration and artistic originals; an aggregate market sector CVM has been calculated for computerised information using ABS industry data; and CVMs have been calculated for all subtotals and totals.

Data sources: Authors' estimates; ABS national accounts data.

The varying growth rates across intangibles have obviously led to a change in the composition of total intangible investment over time. Figure 3.4 highlights the growing importance of organisational capital, computerised information and BERD relative to the other intangibles.

Figure 3.4 **Shares of nominal total intangible investment^a, by asset type**
Per cent



^a For sensitivity of the composition of intangibles investment to some of the assumptions in its compilation, see appendix D.

Data source: Authors' estimates.