

# **Trends in the Value of Intellectual Property in Australia**

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**Intellectual Property Research Institute of Australia**

**Working Paper No. 18/04**

ISSN 1447- 2315

December 2004

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## Introduction

Firm level ‘market value’ studies seek to estimate the returns to investment using stock market, book value and intellectual property (IP) data. These studies, which were initiated by Griliches (1981), aim to establish whether intangible assets, especially those arising from innovation, contribute to (expected) firm profits. In some ways this issue is trivial, since we would not expect firms to repeatedly invest in intangible capital unless they previously had positive experiences. Predictably therefore, we find that significant and positive relationships between patents and market value have become a ‘stylised fact’ around the world. Instead of seeking to reconfirm this ‘fact’, applied economists are now using this model to test whether the value of innovative activities varies with characteristics such as firm size, industry and competition, *inter alia*.

This paper uses a panel of over 300 Australian firms from 1989 to 2002 to examine the relationship between investment activity and expected profits. Although there have been other cross-sectional estimations of this model (i.e. Bosworth and Rogers 2001), there have been no previous Australian panel estimations to-date. Our study is used not so much to derive estimates of the value of innovative activities, but to identify whether the value of Australian IP to companies has been rising or falling over time.

We begin with an introduction to what market value studies are, and what they can usefully tell us and what they cannot. We then present results from a fixed effects panel data estimation of company value to determine whether there have been trends in the value of different forms of company IP over time. Our evidence suggests that the average present value of patents has been falling over the last 14 years, but the value of trade marks has been rising. The trend for designs is less clear.

## What are market value equations?

Market value equations begin with the identity:

$$V \equiv q(A + K) \tag{1}$$

where  $V$  is the current market value of the firm (total value of equity plus total liabilities),  $K$  is the historic (that is, accumulated) cost of intangible assets and  $A$  is the historic value of tangible assets and  $q$  reflects the current market valuation of these assets (such that  $qA$  and  $qK$  are the market values of tangible and intangible assets respectively). Historically, most investment activity by firms was embodied in tangible forms such as land, plant and equipment.<sup>1</sup> The formal accounting system, which defined explicit journals for these items, then produced balance sheets such that across firms as a whole,  $V$  equalled  $qA$ .

However, a growing divergence between the ‘book value’,  $A$ , and the value of companies  $V$  has become apparent over time (see Webster 2000). This value gap has been attributed to the growth of assets typically not recognised by the generally agreed accounting

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<sup>1</sup> Tangibles also includes liquid items such as cash.

principles, such as investments into R&D, the workforce skills, marketing and the organisational architecture of the firm. Expenditures on most of these items are classified in accounts as ‘variable expenditures’ and do not enter the assets ledger even though they make long term contributions to revenues and profits. Accordingly, there is no data for intangible assets, that is comparable to data produced for tangibles.<sup>2</sup>

In order to show that innovation activities create some of these ‘missing’ assets, economists have used indices such as patent application counts and R&D expenditure in lieu of  $K$  in equation (1). In some cases, advertising expenditure as a proxy for market capital has also been used (Hall 1993, Chauvin and Hirschey 1997) but estimates involving measures of investment in the skills of the workforce and the organisational architecture are largely, if not wholly, absent from the literature.

Characteristically, equation (1) is transformed to make it more convenient for estimation after inclusion of an auxiliary relationship to explain the unmeasurable  $K$ , and to accommodate a more general formulation than (1). The transformation makes both formulations suitable for ordinary least squares estimation, although it is not strictly necessary; non-linear least squares can be used as an alternative. If we pursue the linear route, we first divide by  $A$  and take natural logs to get:

$$\ln\left(\frac{V}{A}\right) \equiv \ln q + \ln\left(\frac{K}{A} + 1\right)$$

Recognizing that intangible assets  $K$  are small relative to tangible assets  $A$ , this expression can be simplified using the result that  $\ln(1+x) \approx x$  when  $x$  is small (the tolerance limit for  $x$  is 0.045):

$$\ln\left(\frac{V}{A}\right) \approx \ln q + \left(\frac{K}{A}\right)$$

If we set  $q = \exp(r)$ , where  $r$  represents the various market valuation factors and include a random error term  $\varepsilon$ , then the equation becomes:

$$\ln\left(\frac{V}{A}\right) \approx r + \left(\frac{K}{A}\right) + \varepsilon \tag{2}$$

Now,  $A$  is usually derived from company accounts and ideally  $K$  can be represented, but not measured, by variables which mimic the stocks of intangible assets, that is, the accumulation of past investments into intangible capital. In practice, this means either artificially constructing stocks of IP assets from investment flows – such as R&D expenditure, new patent applications and/or new trade mark applications – or simply using flow data in lieu of  $K$ . One advantage of the estimations used in this paper is that we are able to replace  $K$  with an auxiliary relationship involving actual stocks of patents,

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<sup>2</sup> Formal accounting data on intangible assets only includes expenditures on externally procured items such as patent attorneys fees and licenses. Since most intangibles are produced in-house as intermediate capital items, these estimates are a sub-set of the true level of intangible assets. {Webster, 1999 #140}, p56 estimates that on average, measured intangibles are less than a quarter of the true level of intangible assets.

trade marks and designs from grant and renewal data derived using data from IP Australia; there is no need to rely on either of the approximations.

A more general variant of (1) is to allow for economies of scale, such that:

$$V \equiv q(A + K)^\sigma \quad (3)$$

where  $\sigma > 1$  when economies of scale exist. In this case, following transformations similar to those used to derive equation (2) yields

$$\ln V \equiv r + \sigma \ln A + \sigma \frac{K}{A} + \varepsilon \quad (4)$$

One advantage of this formulation is that when  $\sigma > 1$  the tolerance limit for the approximation to  $\ln\left(1 + \frac{K}{A}\right)$  rises above 0.045 so this model is more flexible than (2).

When the model in equation (4) was estimated, we found an estimate for  $\sigma$  of about 0.6, which implies an implausible level of diseconomies of scale. Consequently, the results that we present below in Table 2 are extensions of the functional form in equation (2).

### What can market value studies tell us?

While the original intention of Griliches' (1981) first market value equation was to establish the place of innovation activities in the missing accounting data, the basic format of these equations has also been used to establish whether secondary interactive characteristics make patents or R&D activity<sup>3</sup> more or less valuable, *ceteris paribus*. In terms of equations (2) and (4), these characteristics constitute part of  $r$ . Tested characteristics have included market power (Connolly *et al.* 1986, Blundell *et al.* 1999, Toivanen *et al.* 2002, Bosworth and Rogers 2001), a measure of the effectiveness of patents for preventing imitation (Cockburn and Griliches 1988), the debt-ratio (Toivanen *et al.* 2002), sales revenue (Hall 1993, Toivanen *et al.* 2002, Bosworth and Rogers 2001, Hall and Oriani 2003) union power (Connolly *et al.* 1986), and profits or cash-flows (Bosworth *et al.* 2000). Industry dummy variables are often included to capture more ill-defined factors such as union power and import penetration which are believed to vary by industry but difficult to collect on a firm by firm basis.

Overall, these studies find that patents are more valuable – as judged by the stock market – in firms where patents are regarded by managers as being more effective, in firms with lower debt ratios, and when the growth in firm's sales revenue is strong (although this result is not consistently found). There was no clear evidence that market power affected the market valuations. Many studies, including this one, also find that either new patent applications,<sup>4</sup> or R&D expenditure, have a positive and significant effect on the firm's market value, but not both together (see Toivanen *et al.* 2002 for example).

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<sup>3</sup> A limited number of studies have also used other innovation measures such as 'innovation counts' which are derived from mentions of innovations in trade journals or external expert assessments of companies innovations. These measures are not widely available and usually only exist for limited time periods.

<sup>4</sup> See the summary in Bosworth and Rogers (2001), Table A1 and Hall (2000), Table 1.

While market value studies seemingly imply that intangible assets are ‘significant’, it is also important not to overstate what they can do. Specifically, they do not tell us whether investing in inventive activity is profitable. They do not indicate what the value of invention is, as distinct from correlated investments such as training, marketing, re-organisation. They do not show whether the legal registration of IP adds (company) value above and beyond the inventive process. And they cannot prove that the stock market correctly values inventions and IP. The following sections discuss each of these issues in turn.

Whether investing in inventive activity is profitable

The attribution of a change in market value to a change in a particular asset is driven by the correlation between value and ownership of the asset over time and across firms. We reason that a change to the ownership of company assets causes company values to change because the latter reflects prospective returns based on current knowledge. The stock market’s expectations of future profits should only change after pertinent information about the firm becomes ‘known’. Since most of our IP variables are ‘announced’ publicly when significant costs have already been incurred, the recorded change to market value will only quantify the prospective returns from that time forward. Past expenditures are sunk costs and would have been factored into the share price at the time they were known. A rise therefore in the market value of a company as a result, for example, of a new patent being applied for, will indicate that the stock market expects the future revenues less prospective costs, to be positive, regardless of how much it cost the company to date to create the invention. However, this does not signal profitability. Unless we know the overall costs of inventing the idea or device, we cannot know whether the whole inventive activity was profitable or not.

To illustrate this point, consider a simple example where there are 2 time periods; in time period 0, the company invests an additional \$1000 into an innovation project, and in time period 1, the company reaps all its additional profits from this innovation. All innovation is financed through borrowings at the annual rate of 10 per cent. Further, assume stock markets predict profits correctly and therefore there is no risk.

The change to company value at time 0 is:

$$\Delta \text{Equities} + \Delta \text{Liabilities} \equiv \Delta \text{present value of expected profits} = \frac{\Delta \text{profits}}{(1 + 0.1)}.$$

In case 1 (shown in Table 1 below), the original investment of \$1000 yields profits of \$1100, which is just enough to repay the loan and interest. Consequently, shareholders do not receive additional dividends and the share price, at time 0, does not rise in anticipation. The value of the company will rise by \$1000 (wholly due to the change in liabilities) even though the whole innovative activity is only just profitable. In case 2, we have the same \$1000 investment into innovation, but expected profits are only \$1050. The cost of the loan is accordingly partly financed through lower than normal dividends which causes the share price to fall at time 0. Even though this is clearly an unprofitable investment, the value of the company still rises at time 0 by \$955. In case 3, we have the converse situation whereby profits of \$1200 are expected. In this example, the value of the company increases by \$1091. A parallel situation exists if the innovation was financed

through new share issues. The value of the company will still rise even if the true profitability of the investment is negative.

This example illustrates how unless we know all the costs of investments into the intangible activities, we cannot tell from examining only changes to the value of companies whether the activity has been profitable or not. In each case the value of the company at time 0 will rise so long as profits, from that point in time forwards, are positive. Unless we know the relative costs of different projects, we cannot even rank the profitability of the various investment activities.

When patent, trade mark or design data are used in the regression analysis as proxies for intangible investment, we have no measure of the costs of acquiring these assets and no way of deriving profitability conclusions from a market value equation. In estimations where R&D expenditure data are available, it is possible to deduce the rate of profitability so long as the R&D figures capture the full cost of the activity. However, as discussed in the next section, this latter qualification also causes us difficulties.

**Table 1: Effects on company value of good and bad investments**

|   | Time 0             | Time 1           | Change to firm value in time 0 |                      |                                   |                    |
|---|--------------------|------------------|--------------------------------|----------------------|-----------------------------------|--------------------|
|   | Cost of investment | $\Delta$ Profits | $\Delta$ Equities              | $\Delta$ Liabilities | $\Delta$ (Equities + Liabilities) |                    |
| 1 | \$1000             | \$1100           | 0                              | \$1000               | \$1000                            | Average investment |
| 2 | \$1000             | \$1050           | -\$45                          | \$1000               | \$955                             | Bad investment     |
| 3 | \$1000             | \$1200           | +\$91                          | \$1000               | \$1091                            | Good investment    |

What the value of invention is, as distinct from correlated investments.

Econometric models essentially calculate effects of one variable on another, separate from all other causes, through disaggregating statistical correlations. However, if two causal factors are closely correlated and one is not measured, then statistically we will be ascribing the effects of both factors to the measured factor. There is a view from the theoretical literature that many intangible activities are correlated in this way, although the evidence for this is scant. If for example, R&D activity is correlated with expenditures on workforce training, then measures of the effects of changes to R&D on company value will inadvertently include the effects of training. The point is that if we do not have measures of the non-invention intangible investment activities, then we may be overstating the effects of inventive activity on market value in our econometric estimations.

Whether higher company value is due to the invention or the IP title

Studies that use registered IP as proxy variables for the extent of the inventive process will for the same reasons discussed above, mix the value of the invention with the value of the IP title. It is possible that the invention has no value to consumers and is unlikely

to be commercialised, but the IP title adds considerably to company profits because it is being used anti-competitively to block and intimidate would-be rivals. The latter, which occurs when firms take out the maximum number of patents they can for any given invention in a bid to confuse and overwhelm competitors, is referred to in the literature as ‘patent bombing’. Market value studies are simply not able to distinguish the separate contribution of the invention and the IP title to company value.

Whether the stock market correctly values inventions & IP

Market value studies rely on the economic ‘law’ of competition, which compels stock markets investors to make unbiased predictions of future profits. However, we know that stock markets regularly make systematic errors, most recently the NASDAQ crash of 2000 and the general stock market slump of 1987. This occurs because good investments on the stock market include a substantial amount of capital gain. To make a capital gain, you have to predict what shares other investors will buy and similarly they need to predict what you will buy. This can lead to a circular or infinite regress situation whereby investors may value certain shares, or forms of IP, simply because they believe other investors will.

Perhaps over the long run, objective factors (whether inventions are on average a profitable activity) may dominate subjective factors (what other share market investors will buy) but the former may take many years, even decades, to prevail. In the meantime, we do not know whether there is a systematic under or over market valuation of IP.

These qualifications aside, estimating the effects of patents, trade marks and designs on company value may be used to first, approximate the present value of the registered IP, together with other correlated intangible assets and secondly, to detect whether there has been a change in this value over time.

### **The effects of IP stocks on the market value of Australian companies**

To estimate equation (2) requires us to define the ratio of intangibles to tangibles,  $\frac{K}{A}$ .

We assume:

$$K = aP + bT + cD$$

where  $P$ ,  $T$  and  $D$  represent the number of registered stocks of patents, trade marks and designs respectively, and  $a$ ,  $b$  and  $c$  are coefficients to be estimated. Patents currently pending during each time period, may also be included as an additional variable.

Accordingly, the equation to be estimated becomes<sup>5</sup>:

$$\ln\left(\frac{V}{A}\right) \approx r + a\left(\frac{P}{A}\right) + b\left(\frac{T}{A}\right) + c\left(\frac{D}{A}\right) + \varepsilon \quad (5)$$

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<sup>5</sup> If we assume there is a non-IP related level of intangible capital proportional to the level of tangible assets, then this effect becomes included in the parameter  $r$ .

Accounting and share market data<sup>6</sup> for all Australian owned parent companies and the highest accounting unit of local foreign companies with an annual turnover over \$50m were matched to patent, trade mark and design titles from the IP Australia data base.<sup>7</sup> Linking was made if the applicant name matched either the name of the parent or one of its subsidiaries.<sup>8</sup> Our final sample consisted of an unbalanced panel of 308 publicly listed companies from 1989 to 2002.

The average value of companies in our sample over the whole period was A\$6,628m (1989-90 prices). The average stocks per company of patents and patents pending were 4.6 and 0.4 and the average number of granted trade mark and design stocks was 60.4 and 8.0.

Four versions of equation (5) were estimated. In all cases the parameter  $r$ , measuring the market valuation of assets, was assumed to vary across firms, but not over time for a given firm. Within the context of our panel data, this assumption can be accommodated by estimating either a fixed effects or a random effects model. Given the possibility of possible correlation between a firm's  $r$  and values of its right-hand-side variables  $A$ ,  $P$ ,  $T$  and  $D$ , we opted for fixed effects estimation (Judge *et al* 1985).

The first column of Table 2 contains estimates of the first version of equation (5). As described above, the variables representing intangible assets are patents, patents pending, trade marks and designs, each expressed as a ratio relative to tangible assets. We found that all granted patent stock variables were significant and positive but the patents pending variable was not significant suggesting that stock market investors do not value applications prior to grant. This may arise because investors expect heavy costs associated with product commercialisation in the early stage of the product life cycle.

To translate these estimates into financial terms, we need to derive and evaluate the partial derivatives  $\frac{\partial V}{\partial P}$ ,  $\frac{\partial V}{\partial T}$ ,  $\frac{\partial V}{\partial D}$ . Evaluating the derivatives at the mean levels of all variables, we find that the value of an additional patent (with other unmeasured and correlated investments) adds, on average, A\$933,000 to the value of the company, all other things held constant. The additional values for trade marks and designs were A\$141,000 and A\$803,000 respectively.

The second estimation weights the IP stock by the age (in days) of the average granted title and reveals a similar pattern to the unweighted equation. This suggests that the additional information embodied in the renewal data adds little to the total explanatory power of the equation.

To assess whether these values are rising or falling over time we make the coefficients  $a$ ,  $b$  and  $c$  linear functions of time. For example, we write

$$a_t = \alpha_0 + \alpha_1 t$$

where  $\alpha_0$  and  $\alpha_1$  are unknown coefficients and  $t$  is a time index. Making this and similar substitutions for  $b$  and  $c$  into equation (5) leads to a model with time interacting with the

<sup>6</sup> These data were sourced from the IBISWorld and the AGSM databases.

<sup>7</sup> Only applications from Australian resident entities were matched.

<sup>8</sup> A company is defined as a subsidiary of a parent if the latter owns at least 50 per cent of the former.

IP variables. The results for this model appear in columns 3 and 4 of Table 2. The first unweighted estimates indicate that patents have been falling in value but trade marks and designs have been rising in value. However, these trends are at the expense of the significance of the trade mark and design stock variables. The decline in patent value is unlikely to be due to poor general macroeconomic conditions, for over the same time, the market capitalisation of companies (deflated to 1989-90 dollars) exhibited a strong positive trend. However, macroeconomic conditions may explain some of the rise in value of trade marks and designs.

The main difference found in the final estimation, which considered weighted IP stocks with time trends, was the significant and positive effect of the stock value for designs. This however was achieved at the expense of its time trend.

Both the time trend equations implied that the average present value of a patent fell from 1989 to 2002 possibly reflecting a lower intrinsic value of the invention over time or more competitive markets resulting in lower profit margins for new products. However, we have no direct evidence for either of these hypotheses. Over the same time horizon, the average present value of a registered trade mark rose and this may be due to the rising importance of branded goods and services in the economy, or the anti-competitive benefits to firms of using brands as barriers between themselves and rival companies.

**Table 2: Effects of IP variables on company value, fixed effects estimation**

| Ln(Company value/ tangible assets)   | Coef.             |       | t                       |       | Coef.             |       | t                       |       |
|--------------------------------------|-------------------|-------|-------------------------|-------|-------------------|-------|-------------------------|-------|
|                                      | <i>Unweighted</i> |       | <i>Weighted by days</i> |       | <i>Unweighted</i> |       | <i>Weighted by days</i> |       |
|                                      | 1                 | 2     | 3                       | 4     | 5                 | 6     | 7                       | 8     |
| Patents/Tangible assets              | 607.69            | 3.2   | 0.2088                  | 5.13  | 2582.2            | 5.83  | 1.177                   | 6.17  |
| Pending patents/Tangible assets      | 911.17            | 0.77  |                         |       | 9812.2            | 2.52  |                         |       |
| Trade marks/Tangible assets          | 91.58             | 4.61  | 0.0095                  | 2.93  | -17.43            | -0.71 | -0.005                  | -1.34 |
| Designs/Tangible assets              | 523.35            | 7.04  | 0.1913                  | 6.34  | 101.61            | 0.85  | 0.124                   | 2.72  |
| Patents*time/Tangible assets         |                   |       |                         |       | -177.90           | -3.83 | -0.085                  | -5.18 |
| Pending patents*time/Tangible assets |                   |       |                         |       | -873.91           | -2.06 |                         |       |
| Trade marks*time/Tangible assets     |                   |       |                         |       | 20.17             | 6.44  | 0.006                   | 8.22  |
| Designs*time/Tangible assets         |                   |       |                         |       | 19.68             | 1.43  | -0.004                  | -0.76 |
| Constant                             | 0.37              | 39.37 | 0.3856                  | 42.05 | 0.35              | 37.29 | 0.353                   | 36.07 |
| R2 – within                          | 0.096             |       | 0.053                   |       | 0.129             |       | 0.094                   |       |
| Number of observations               | 2446              |       | 2446                    |       | 2446              |       | 2446                    |       |
| Number of companies                  | 308               |       | 308                     |       | 308               |       | 308                     |       |

## Conclusion

Market value equations cannot tell us whether the innovation process has been profitable, nor whether any prospective profits are attributable to the innovative activities or other associated activities. They can however indicate the direction of trends in the value of the different IP components. If we accept that on average, over the period 1989 to 2002, stock market investors made reasonable predictions of future company profitability, we find that the average value of patents has been falling over time, while the average value of trade marks has been rising. The trend for design values is less clear.

There are several possible reasons for these developments. The value of patents may be falling because either examiners are increasingly prepared to pass applications with lower levels of inventive step, the mix of applications by technology is changing in favour of less valuable inventions, or because the market for products, which embody patented material is becoming more competitive thereby yielding lower profit margins. There maybe a hidden selection process going on whereby over time, owners of the more valuable inventions are deciding not to use patents to prevent imitation, but other non-patent forms of appropriability.

The value of trade marks on the other hand may be growing because increasingly new brands, especially formally registered brands, are seen as critical to the marketing and commercialisation of product lines. This may reflect a deeper change in the way goods and services are standardised and packaged. Alternatively, rising trade mark values may reflect a rise in the examination threshold. Although given the strong growth in the absolute number of trade marks per unit of GDP in recent years,<sup>9</sup> this is unlikely.

## References

- Blundell, R., Griffith, R. and Van Reenen, J. (1999), Market Share, Market Value and Innovation in a Panel of British Manufacturing Firms, *Review of Economic Studies*, **66**, 529-554.
- Bosworth, D. and Rogers, M. (2001), Market Value, R&D and Intellectual Property: An Empirical Analysis of Large Australian Firms, *Economic Record*, **77**, 323-337.
- Bosworth, D., Wharton, A. and Greenhalgh, C. (2000) Intangible assets and the market valuation of UK companies: Evidence from fixed effects models, In *Oxford Intellectual Property Research Centre*, Vol. 2/ April 2000 St Peter's College, Oxford.
- Chauvin, K. W. and Hirschey, M. (1997), Market Structure and the Value of Growth, *Managerial and Decision Economics*, **18**, 247-254.
- Cockburn, I. and Griliches, Z. (1988), Industry effects and appropriability measures in the stock market's valuation of R&D and patents, *American Economic Review*, **78**, 419-423.
- Cohen, W. M., Nelson, R. R. and Walsh, J. P. (2000) Protection their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not), In *NBER Working Paper Series*, Vol. 7552 National Bureau of Economic Research.

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<sup>9</sup> See Jensen and Webster (2004).

- Connolly, R. A., Hirsch, B. T. and Hirschey, M. (1986), Union Rent-Seeking, Intangible Capital, and Market Value of the Firm, *Review of Economics and Statistics*, **68**, 567-577.
- Griliches, Z. (1981), Market Value, R&D and Patents, *Economics Letters*, **7**, 183-187.
- Hall, B. (1993), The Stock Market's Valuation of R&D Investment During the 1980s, *American Economic Review*, **83**, 259-264.
- Hall, B. and Oriani, R. (2003) Does the market value R&D investemnt by european firms? Evidence from a panel of manufacturing firms in France, Germany and Italy, In *DRUID Conference and EEA-ESAM Conference* Elsinore and Stockholm.
- Hall, B. H. (2000), Innovation and Market Value, In *Productivity, innovation and economic performance* (Eds, Barrell, R., Mason, G. and O'Mahony, M.) National Insititute of Economic and Social Research and Cambridge University Press, London and Cambridge.
- Jensen, P. and Webster, E. (2004), Recent patterns of trade marking activity in Australia', *15(2)*, 112-126, *Australian Intellectual Property Journal*, **15**, 112-126.
- Judge, G.G., Griffiths, W.E., Hill, R.C., Lütkepohl, H. and Lee, T.-C. (1985), *The Theory and Practice of Econometrics*, second edition, New York: John Wiley and Sons.
- Levin, R. C., Cohen, W. M. and Mowery, D. C. (1985), R&D Appropriability, Opportunity and Market Structure: New Evidence on some Schumpeterian Hypotheses, *American Economic Review*, **75**, 20-24.
- Toivanen, O., Stoneman, P. and Bosworth, D. (2002), Innovation and the Market Value of UK Firms, 1989-1995, *Oxford Bulletin of Economics and Statistics*, **64**, 39-61.
- Webster, E. M. (2000), The growth of intangible enterprise investment in Australia, *Information Economics and Policy*, **12**, 1-25.

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