

# **What Creates Abnormal Profits: Collusion, Efficiency or Strategy?\***

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## Abstract

In this paper, we re-examine the debate regarding the determinants of persistent abnormal profits. Abnormal profits are estimated using data on tangible and intangible capital for 2700 Australian firms over a 17-year period. The determinants of abnormal profits are then estimated using variables collated from separate accounting and administrative data as well as a survey of innovation and management practices. Our results imply that firm-specific factors relating to efficiency and strategy are more important in explaining abnormal profits than the industry-specific effects of collusion.

## I. Introduction

Debate over the causes of persistent firm profitability has raged in the industrial economics and strategic management literatures over the last 50 years or more. On one side of the ledger lie the *industry-collusion* economists who, following Bain (1956), argue that technologically-created entry barriers create opportunities for collusion and the extraction of monopoly profits (see Baumol and Willig 1981; Schmalensee 1985; Perrakis and Warskett 1986; Scherer and Ross 1990; McGahan and Porter 1999). Such barriers to entry undermine social welfare by enabling firms to curtail production and raise price.<sup>1</sup>

On the other side are the *firm-efficiency* economists, such as Demsetz (1973) and Brozen (1971), who have argued that the accumulation of unique internal resources provides cost advantages for firms and that this superior efficiency enables firms to grow in size and generate above-normal profits. Higher levels of industry concentration are simply a by-product of this process.<sup>2</sup> The two explanations have fundamentally different welfare implications since the *industry-collusion* view implies that the

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<sup>1</sup> Baumol and Willig (1981, p.408) explicitly define barriers to exclude incumbent advantages associated with lower costs.

<sup>2</sup> In addition, Mancke (1974) has shown deductively how a positive relationship between market concentration and profitability can be jointly determined even when returns are random across firms and over time, provided firms automatically re-invest a portion of last period's profits.

observed profits arise from welfare-reducing activities, while the *firm-efficiency* view implies that the observed profits arise from welfare-enhancing activities.<sup>3</sup>

This ongoing debate has important implications for industry regulation since most developed countries rely on market concentration as an indicator of industry performance. When considering whether to allow proposed mergers and acquisitions, for example, regulators typically view higher levels of concentration as undesirable.<sup>4</sup> But if the *firm-efficiency* view of the world is correct, informing regulatory policy using concentration measures in this way is not just misguided, it may be counter-productive.

There are two fundamental problems with existing empirical approaches directed at disentangling the competing theories. First and foremost is the measurement of profits. Existing studies rely on measures of profits that do not account for intangible capital or differentiate between normal/abnormal uncertainty.<sup>5</sup> This means that previous studies may conflate the effects of normal returns to intangible capital and abnormal uncertainty with abnormal returns. To address these shortcomings, we include proxies for intangible capital – such as the firm’s stock of intellectual property (IP) – and market uncertainty in the measurement of profits.

Second, the literature has typically attempted to examine the role of firm efficiency using either firm dummy variables or firm-specific market share. However, market share captures the extent of past successful efficiency, management activities and is therefore an imperfect proxy for the *firm-efficiency* hypothesis. To address this, we employ *a set of* firm-specific variables in our model including market

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<sup>3</sup> Demsetz persuasively argued that his interpretation of the observed facts was based on cost-side efficiency improvements (which are welfare-enhancing) rather than demand-side strategies or *ex post* limits to competition (which may not be).

<sup>4</sup> A key underlying assumption is that both firms are operating beyond the minimum efficient scale so there is no loss of efficiency if the merger is prohibited.

<sup>5</sup> Although the importance of these issues is well known, they are extremely difficult to account for. This problem is noted by McGahan and Porter (1997) who state that: “Our study is limited by the shortcomings in accounting measures of profit. Because accounting conventions exclude intangible assets from the balance sheet, measured assets may be too low....” (p.17).

share and self-reported measures of the strategies firms use to protect their competitive advantage. This enables us to separate the effects of accumulated returns to managerial decisions concerning the direction of the firm's efficiency, strategy and rent-seeking activities (proxied by market share) and current strategic positioning (proxied by self-reported measures on how firms protect their competitive advantage).<sup>6</sup>

The analysis is undertaken in two stages. In the first stage, we construct an unbalanced panel dataset which includes data on accounting profits, tangible capital and proxies for intangible capital on 2700 Australian companies over a 17-year period. Estimates of long-run profitability for each company are then obtained using weighted least-squares (WLS), where the estimated firm fixed-effects are interpreted as an estimate of abnormal profits. In the second stage, we examine the relationship between estimated abnormal profits, industry characteristics and a set of firm-specific variables. To the best of our knowledge, this is the first study that has addressed the determinants of abnormal profits using this approach.

This paper is organised as follows. Section II outlines the competing theories of persistent abnormal profits. Section III provides some definitions of the concepts used in this paper and outlines the model used to estimate the magnitude and determinants of abnormal profits. Section IV discusses the data set used and provides some descriptive statistics. The results and analysis are presented in Section V. Finally, Section VI presents some conclusions and policy implications.

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<sup>6</sup> Ideally, we would also like to separate accumulated returns to efficiency from accumulated returns to strategy. However, as we will see when we present more detail on the survey data, we only observe the firm's current (or forward-looking) strategic intent. Therefore, accumulated returns to strategy remain embedded in our market share variable. Nevertheless, there may be a positive relationship between current strategy and past strategy.

## II. Theories of persistent abnormal profits

Understanding the existence and causes of abnormal profit is one of the most enduring issues in economics. Smith (1776) argued that when few sellers exist in a market, competition fails to discipline the firms and collusive price setting, tacit or explicit, can flourish. The existence of a small number of sellers in a market may be explained by the presence of barriers to entry. Such barriers have been attributed to laws and government fiat (Smith 1776); sunk costs (Baumol and Willig 1981); economies of scale (Bain 1968); advertising (Bain 1968); and differential cost functions (Stigler 1968). These theories all argued that the genesis of barriers to entry is exogenous to the firm's managerial decisions. In such a world, industry concentration creates conditions conducive to collusion and the generation of abnormal (collusion) profits. We refer to this as the *industry-collusion* view of abnormal profits.

This view was challenged by the *firm-efficiency* school of thought pioneered by Brozen (1971) and Demsetz (1973, 1979, 1982). They argued that market concentration and abnormal profits may be simply by-products of sustained superior efficiency rather than an abuse of market power. Barriers to entry, and the resultant concentration, are natural outcomes of firms striving for efficiency in the context of uncertainty, resource heterogeneity and factor immobility.<sup>7</sup> Rivals of successful firms have difficulty copying the complete suite of profitable intangible assets since this requires replication of the entire accumulation path. In this view of the world, barriers to entry are endogenous.

Since the early 1980s, the *firm-efficiency* view has been augmented by the burgeoning literature on the resource-based view of the firm (see Wernerfelt 1984; Rumelt 1984, 1991; Barney 1991; Peteraf 1993; Teece and Pisano 1994; Peteraf and Barney 2003). At the heart of this literature is the notion that firms strive to achieve and maintain a competitive advantage over rivals. As Rumelt (1991, p.167, 173) states: profitability arises from the 'unique endowments and actions of business corporations...which include business-specific skills, ...reputations,...learning, patents and other intangible

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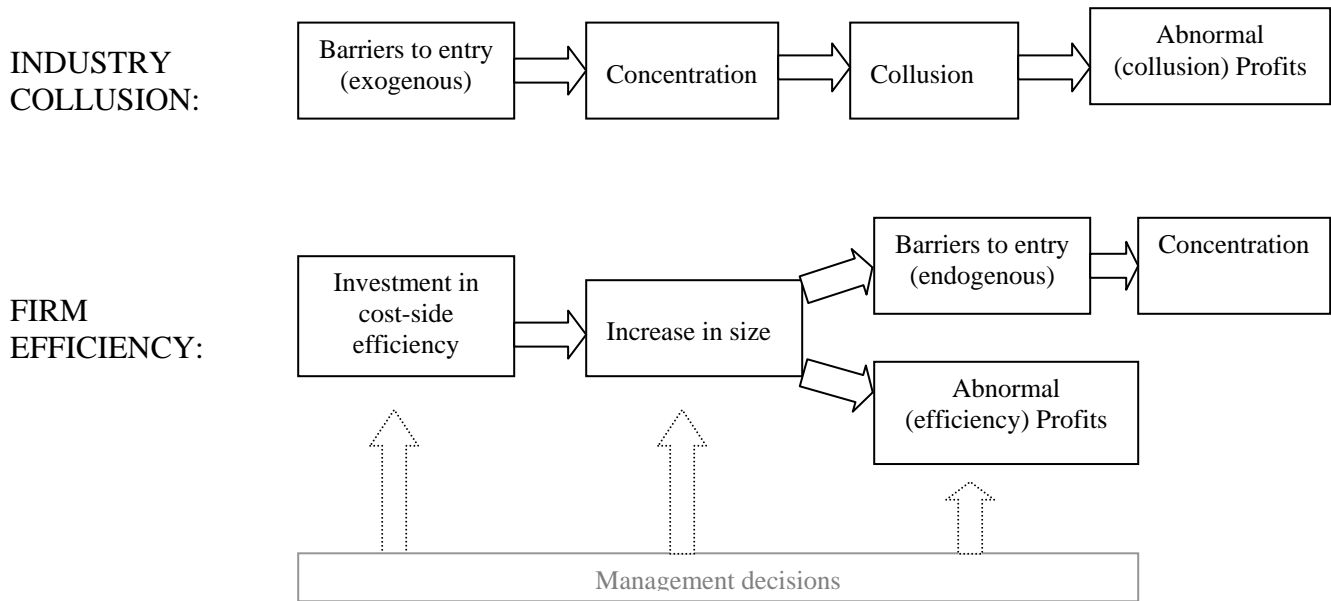
<sup>7</sup> Also see Lippman and Rumelt (1982) for a discussion of these issues.

contributions...’. This line of argument resonates with Demsetz’s position on the importance of the firm’s unique resources. However, management theorists place more emphasis on demand-side factors such as the range of strategies used to limit *ex post* competition and inhibit imitation, in addition to the cultivation of capabilities to build and sustain the firm’s competitive advantage. Such behaviour may not be welfare-enhancing since endogenously-determined barriers to entry may simply be a result of rent-seeking behaviour by the firm – such as predatory pricing or the construction of patent thickets.

While the *industry-collusion* theory is well-specified and testable, the resourced-based and strategic management views are typically more ambiguous: they represent an agglomeration of conjectures about firm profitability rather than well-defined, refutable theories. There is such an array of behaviours which create and protect competitive advantage (and profits) in the resource-based view that the absence of a specific behaviour is not inconsistent with any of its predictions. As a result, these theories are hard to test in a rigorous, systematic fashion.

One of the problems for researchers interested in examining the sources of persistent abnormal profits is establishing cause from effect and correlation. To see this more clearly, we summarise the lines of causation implied by the two theories in Figure 1 below. According to the *industry-collusion* view, abnormal profits can arise only in the presence of market concentration whereas according to the *firm-efficiency* view, abnormal profits may go hand-in-hand with, but are not caused by, concentration. Another important difference between the two theories is that while efficiency profits are typically a consequence of firm size, the existence of collusion profits should not be related to firm size *per se* (since firms of all sizes benefit from monopoly prices). However, industries usually only achieve concentration by the growth of one or more of their constituent firms. Accordingly, we are able to say that once the level of industry concentration has been accounted for, market share should have no effect on profits if the *industry-collusion* view is correct. Once we are able to control for market share, concentration should have no effect on profits if the *firm-efficiency* view is correct.

**Figure 1: Theories regarding the creation of abnormal profits**



### III. Estimating abnormal profits

Profits ( $\Pi$ ) are defined as company incomes net of payment for consumables but gross of interest, tax, depreciation and amortisation (EBITDA). The annual rate of profitability ( $\pi$ ) is the level of profits in a given year divided by the present value of all investments financed through share issues, debt or retained earnings in the company since its inception. In accounting parlance, total assets represent the present value of investment if all asset values have been re-valued for unanticipated market changes and inflation, and if all expenditures which are expected to yield returns beyond a year are classified as investments.

Firm  $i$ 's rate of profit, at time  $t$ , may be decomposed into a normal rate ( $n$ ), an abnormal rate ( $a$ ) and a temporary windfall gain ( $\omega$ ):

$$\pi_{i,t} \equiv n + a_i + \omega_t \quad (1)$$

*Ex ante* normal profit consists of the opportunity cost of capital (i.e. the default-free interest rate) and the return to the average level of business uncertainty.<sup>8</sup> Abnormal profits are persistent profits which are above or below this normal rate of profit.<sup>9</sup> Accordingly, whether a firm generates above-normal profits depends on how one estimates the premium for average uncertainty.<sup>10</sup> Windfall profits are unexpected and represent temporary gains due to transient macroeconomic conditions, *inter alia*.<sup>11</sup>

From the above discussion, abnormal profits, then, may be composed of returns to collusion ( $c$ ), efficiency ( $e$ ), firm-specific strategic management factors ( $m$ ), and returns to (above or below) average levels of uncertainty ( $u$ ):

$$a_i \equiv c_i + e_i + m_i + u_i \quad (2)$$

Note that returns to abnormal uncertainty cannot be calculated objectively since, by definition, there are few data upon which to forecast outcomes. This is particularly relevant to intangible investment, such as R&D, since firms typically do not know *ex ante* whether the investment will result in a final product (i.e. there is technological uncertainty) or whether the final product will find a niche in the market (i.e. there is market uncertainty). However, as we shall illustrate below, subjective measures can be constructed to proxy for abnormal uncertainty.

The absolute level of profit for firm  $i$  in year  $t$  is:

$$\Pi_{i,t} \equiv \pi_{i,t} K_{i,t} \quad (3)$$

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<sup>8</sup> Knight (1921) showed that profits are not required to compensate for risk if there are enough repeat observations to provide a (near) certain outcome. By definition, certainty does not arise from pooling uncertain occurrences.

<sup>9</sup> We use the term “abnormal profits” here in preference to similar concepts such as “monopoly profits” or “supernormal profits” since the prefix “abnormal” clearly articulates that the rate of profit could be above *or below* the normal rate. Moreover, it is a neutral term which doesn’t attribute the source of the profit to any specific factor – abnormal profits could be due to market power (i.e. monopoly profits) or superior efficiency (i.e. efficiency profits).

<sup>10</sup> Demsetz (1973, p.3) points out that high profits do not arise from artificial scarcity and collusion but are due to ‘the combination of great uncertainty plus luck or atypical insight’.

<sup>11</sup> Windfall gains could also be attributable to firm-specific external shocks, but for simplicity, we do not allow for that possibility in our model.

where  $K$  is the accumulation of prior shareholder investments (depreciated for obsolescence). Substituting Equations (1) and (2) into Equation (3) gives:

$$\Pi_{i,t} \equiv (c_i + e_i + m_i + u_i) K_{i,t} + nK_{i,t} + \Omega_t \quad (4)$$

In this model, the abnormal profit variables –  $c_i$ ,  $e_i$ ,  $m_i$  and  $u_i$  – are firm-specific but time-invariant, the normal profit variable,  $n$ , is common across the whole economy, and to simplify matters, we assume the windfall gain variable,  $\Omega (= \omega K)$ , is only time-varying.

Capital,  $K$ , consists of both assets formally measured by accounting standards, ( $K^A$ ), and unmeasured intangible assets ( $K^I$ ). Accounting standards only require firms to identify and record their investments in tangible capital (plus a limited number of intangible assets), and accordingly typical measures of profitability – such as price-cost margins or returns-on-equity – exclude intangibles from both the numerator and the denominator.<sup>12</sup> Measures of accounting profitability, therefore, are likely to produce biased estimates since they conflates the effects of normal returns to investments in intangible capital with abnormal profits.<sup>13</sup> Accordingly, most studies on the existence and persistence of abnormal profits, such as McGahan and Porter (2003), may be merely measuring the existence and persistence of different proportions of intangible assets across companies, *not* abnormal profits. Without some account for intangibles, the case for establishing and explaining abnormal profits is weak.

Thus from Equation (4), profits can be expressed as:

$$\Pi_{i,t} \equiv (c_i + e_i + m_i + u_i) (K_{i,t}^A + K_{i,t}^I) + n (K_{i,t}^A + K_{i,t}^I) + \Omega_t \quad (5)$$

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<sup>12</sup> See Demsetz (1982). In addition, Fisher and McGowan (1983) have shown how the use of differing depreciation rules in accounts can affect the calculated returns on assets.

<sup>13</sup> Measuring abnormal profits as the difference between book and market value (as used by Smirlock et al. 1984) also conflates normal and above normal returns to intangible assets.

If we write  $K_{i,t}^A$  and  $K_{i,t}^I$  in terms of deviations from their firm means, say  $K_{i,t}^A = \bar{K}_i^A + v_{i,t}$  and  $K_{i,t}^I = \bar{K}_i^I + \eta_{i,t}$ , then Equation (5) can be rewritten as:

$$\Pi_{i,t} = a_i + n(K_{i,t}^A + K_{i,t}^I) + \Omega_t + \varepsilon_{i,t} \quad (6)$$

$$\text{where } a_i = (c_i + e_i + m_i + u_i) \left( \bar{K}_i^A + \bar{K}_i^I \right) \quad (7)$$

$$\text{and } \varepsilon_{i,t} = (c_i + e_i + m_i + u_i)(v_{i,t} + \eta_{i,t}). \quad (8)$$

Equation (6) is recognisable as the fixed-effects model which forms the basis of our estimating equation. To calculate Equation (6), we require data on accounting profit, tangible assets, macroeconomic conditions and intangible capital. Since intangible capital cannot be perfectly observed, we follow Griliches (1981), Griliches et al. (1987), Lanjouw et al. (1998), Hall (2000), Bosworth and Rogers (2001), Greenhalgh and Longland (2005) and Greenhalgh and Rogers (2006a,b), and use time-varying firm-level intellectual property (IP) data to proxy for unmeasured intangible capital,  $K^I$ . By treating intangible capital in this way, it should be clear that our measure of intangible capital is *backward-looking* rather than *forward-looking*. By including a simple measure of patent application counts as a proxy for intangible capital, we explicitly account for a broad range of intangible capital. In fact, we use the full set of recorded IP variables – including applications and stocks of patents, trade marks and designs – as well as company age.

In the first stage of the empirical analysis, our model for estimating abnormal profits using panel data is as follows:

$$\Pi_{i,t} = a_i + nK_{i,t}^A + n[\beta_P \mathbf{P}_{i,t} + \beta_{TM} \mathbf{TM}_{i,t} + \beta_D \mathbf{D}_{i,t} + \beta_A A_{i,t}] + \theta Year_t + \gamma \Pi_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where  $\mathbf{P}_{it}$ ,  $\mathbf{TM}_{it}$  and  $\mathbf{D}_{it}$  are vectors of the firm's patents, trade marks and designs respectively;  $n$  is the normal rate of profit (which is common across all firms);  $A_i$  is the firm's age; and  $Year_t$  is a series of year dummies to account for year-based uncertainty.<sup>14</sup>

We have included IP stocks (rather than IP flows) as explanatory variables since stocks are capital measures, whereas IP flows are investment measures.<sup>15</sup> The IP stock is determined by the number and length (in years) of IP titles currently in-force.<sup>16</sup> We also include an interaction term (current IP applications with time) to capture any trends in the value of IP. Over and above these IP measures, we include company age as a proxy for the accumulation of other intangible assets such as the knowledge and capabilities of the workforce, marketing, distribution and organisational capital.

To control for an omitted variables because our proxies for intangible capital are imperfect, our empirical specification allows for a lagged dependent variable. Although use of a lagged dependent variable in panel estimation is known to produce biased estimates of  $\beta$  (the so-called "Nickell Bias"<sup>17</sup>), our interest here is in the fixed-effects which are unbiased (but inconsistent as N increases). Given this, we interpret the estimated fixed-effects,  $a_i$ , as unbiased estimates of abnormal profits.

In the second stage of the empirical procedure, we examine the determinants of our estimated abnormal profits. The firm-specific estimated fixed-effect,  $a_i$ , comprises returns to collusion, efficiency, strategy and abnormal risk and uncertainty –  $c_i$ ,  $e_i$ ,  $s_i$  and  $u_i$  respectively. Since  $a_i$  is denoted in terms of a level, it varies according to the assets of the firm,  $\overline{K}_i^A$ , as shown in equation (7).

We therefore estimate:

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<sup>14</sup> Since our capital measure is a combination of financial data ( $K^A$ ), count data ( $P$ ,  $TM$ ,  $D$ ) and firm characteristics ( $A$ ), we can not calculate rates of profit and must estimate the equation with profit levels on the left-hand side.

<sup>15</sup> In the model, we include two different patent stock variables: those granted and those whose applications are still pending, since it is common for the patent examination process to take up to 6 years.

<sup>16</sup> Since a maintenance fee must be paid annually (after Year 4) at the Australian Patent Office in order to renew a patent, only patents with economic value are renewed over time.

<sup>17</sup> See Nickell (1981).

$$a_i = (c_i + e_i + s_i + u_i) \left( \bar{K}_i^A \right) \quad (2)$$

In this model, the determinants of abnormal profit variables – which we refer to as *Collusion*, *Efficiency*, *Strategy*, and *Uncertainty* – are firm-specific but time-invariant.

Since the basis of the *industry-collusion* hypothesis is that exogenous barriers to entry provide opportunities for firms to extract monopoly profits, the variable *Collusion* should be significantly related to abnormal profits. This effect is captured in the empirical model using the degree of concentration in the firm's industry. *Efficiency* is measured by the firm's market share (see Clarke et al. 1984, for example, and the literature review in Slade 2004). The rationale for using concentration and market share as proxies is as follows: if collusion is the source of abnormal profits, then firms of all sizes within a concentrated industry will have abnormal profits since all firms benefit from monopoly prices. However, if inter-firm differences in efficiency are the cause of abnormal profits, then size should matter. Once size is controlled for, the concentration effect will disappear.<sup>18</sup> If measures of industry concentration and market share are highly correlated, however, this will curtail their ability to disentangle the *firm-efficiency* and *industry-collusion* theories. In our empirical setting, however, this is not a major concern since the correlation between the two variables is quite low.<sup>19</sup>

The *Strategy* variable represents the main methods firms use to protect their competitive advantage. These comprise the use of patenting, secrecy, lead time, organisational complexity and control over distribution networks. According to Demsetz, Rumelt and others, these factors play an important role in the ways firms protect their unique assets. The *Uncertainty* variable is a self-reported measure of the volatility of the firm's product and input markets. As is well-known, uncertainty plays an important

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<sup>18</sup> However, as noted previously, market share is not a perfect proxy for firm efficiency since it also picks up returns to predatory pricing and other rent-seeking behaviour.

<sup>19</sup> For the 2689 firms in the full sample, the correlation between market share and industry concentration is 0.22. For the 447 firms in the second stage regression it is 0.41.

role in the determinants of profits. This variable should be positively related to the magnitude of abnormal profits since firms will demand a premium for bearing uncertainty.

Since this second stage of the analysis is conducted on a cross-section of data, the direction of causality between the management variables and abnormal profits is difficult to ascertain. Nevertheless, our use of self-reported strategy variables represents a departure from the main thrust of the empirical literature entering the debate<sup>20</sup> which typically reduces the empirical specification to the relative explanatory contribution from industry dummies versus firm dummies.

#### **IV. Data and descriptive statistics**

The main source of data for the panel estimation is IBISWorld, which is a proprietary dataset of all Australian-located parent organisations (and the highest accounting unit of foreign firms) with an annual turnover greater than \$50m during the period 1989-2006.<sup>21</sup> IBISWorld contains data on profits, size, and turnover for a range of different organisation types including public and private companies, trusts, associations, cooperatives and partnerships.<sup>22</sup> However, the vast majority of organisations are either public companies (49 per cent) or private companies (49 per cent). In total, over the period 1989-2006, there were 3,928 distinct organisations in the IBISWorld dataset. Company age was calculated using the Australian Securities and Investment Commission's company registration database.

Our sample consists of all 2,689 organisations in IBISWorld which reported a profit (68 per cent of the population of organisations). In order to construct a proxy of each organisation's intangible capital,

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<sup>20</sup> See Rumelt (1984), Roquebert et al. (1996), Hawawini et al. (2003), Spanos et al. (2004).

<sup>21</sup> This includes Australian-owned companies and the highest accounting unit of Australian-located foreign owned multinational companies.

<sup>22</sup> Given the special treatment of loans and deposits in banking sector accounts, we exclude banks, building societies and credit unions from our estimations. These organisations are identified by their ANZSIC code K732.

annual ‘parent’ accounting data from IBISWorld were matched across to data on patents, trade marks and designs owned by Australian organisations. These data are sourced from IP Australia, which is the Australian patent, trade mark and design office. A match was made if the applicant name was identical to either the name of the parent company or one of its subsidiaries.<sup>23 24</sup> These data enabled us to construct IP stock variables, calculated as the sum (in years) of all IP currently in-force (using both IP grant and IP renewal data).<sup>25 26</sup>

Table 1 presents selected descriptive statistics for our sample. On average, organisations in our sample were 27.6 years old with an average reported annual profit figure of \$66m and shareholder funds of \$538m (both in 1989-90 prices). The average stock of patents granted was 0.69 years, with the average stock of trade marks and designs being 17.89 and 1.44 years respectively.

**Table 1: Sample Descriptive Statistics – average per organisation<sup>(c)</sup>**

Organisation Type	Number	Company age (years)	EBITDA (A\$000) <sup>(a)</sup>	Lagged total assets (A\$000) <sup>(a)</sup>	Patent stock (years) <sup>(b)</sup>	Trade mark stock (years) <sup>(b)</sup>	Design stock (years) <sup>(b)</sup>
Association	7	19.4	15,172	99,710	0.00	10.57	0.34
Co-operative	12	18.4	13,507	140,595	0.15	26.46	1.27
Private company	1352	25.1	28,206	188,674	0.29	11.70	0.64
Public company	1318	29.9	98,431	839,325	1.03	23.06	2.12
<b>Total</b>	<b>2,689</b>	<b>27.6</b>	<b>65,793</b>	<b>537,571</b>	<b>0.69</b>	<b>17.89</b>	<b>1.44</b>

**Notes:** (a) All financial variables have been deflated by the CPI (1989-90=100). EBITDA stands for Earnings Before Interest, Tax, Depreciation and Amortisation. (b) Averages for patent, trade mark and design counts include zeros. (c) All statistics are calculated as averages over the period 1989-2006.

In order to undertake the second stage of the empirical analysis – where we analyse the determinants of abnormal profits – we constructed the explanatory variables *Collusion*, *Efficiency*, *Strategy* and

<sup>23</sup> A company is defined as a subsidiary of a parent if the latter owns at least 50 per cent of the former.

<sup>24</sup> It is possible that the intellectual property for an innovation made by a local enterprise is owned in the name of its foreign parent company. A small survey by the authors of 91 patenting companies in 2002 and 2003 revealed that, in general, 80 per cent of patents were taken out in the name of the local entity and only 14 per cent in the name of a foreign parent or subsidiary (the remainder being the inventor and ‘other’).

<sup>25</sup> Unlike Hall et al. (2005) – who estimates patent stocks using past applications – our stock measure is constructed using data on patents currently in-force.

<sup>26</sup> In the analysis, we actually use two types of patent stocks: a stock of patents granted (and still valid) and a stock of patents pending. The latter are more recent applications but, as a result of the duration of the patent examination process, may relate to inventions which are up to 6 years old.

*Uncertainty* using data from the Australian Bureau of Statistics (ABS) and the Melbourne Institute Business Survey. The variable *Collusion* is constructed using the Herfindahl concentration index for 2-digit industries in 2000-01, which is published by the ABS.<sup>27</sup> The variable *Efficiency* is proxied by the firm's market share, which is the average total sales as a proportion of total sales in the company's 2-digit industry over the period 1996-97 to 2002-03. This is calculated from IBISWorld and ABS data.<sup>28</sup>

The explanatory variables *Strategy* and *Uncertainty* were both derived from a range of questions asked in the Melbourne Institute Business Survey over the period 2001-2006. Approximately 1,400 organisations are sent surveys each year (which equates to a total of 8,400 surveys distributed over the six years). Each year, approximately 18 per cent of organisations respond to the survey – a response rate which is broadly consistent with other surveys of this type (see for example, Huselid 1995; Covin et al. 2001).<sup>29</sup> Out of the 1,500 valid surveys we received, we were able to match 447 observations to the estimates of abnormal profits. The distribution of matched responses across industry does not differ markedly from the population, implying that the sample used in the second stage estimation is representative (see Table 6 in the Appendix for details).

Survey respondents answered a range of questions on their organisation's management and innovation strategies using a seven-point Likert scale. The variable *Strategy* is a set of variables relating to the importance a firm places on different appropriation mechanisms including patenting, secrecy, lead time, organisational complexity and control over distribution networks. Each variable was calculated by taking the average of scaled responses to questions about the different appropriation mechanisms. The variable *Uncertainty* captures the degree of uncertainty felt by the firm in their environment. This

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<sup>27</sup> Australian Bureau of Statistics Cat. No. 8140.0.55.001 Industry Concentration Statistics, Data Report - Electronic Delivery 2000-2001. Ideally, we would use more disaggregated Herfindahl measures – say, at the 3- or 4-digit level. However, such measures are not currently available. Nevertheless, 2-digit measures of concentration contain more information than simple industry dummy variables which are commonly used in the literature.

<sup>28</sup> Total company sales data are collated from IBISWorld and the data on average sales in each industry are collated from the ABS (Cat No. 5206006).

<sup>29</sup> The response rate fluctuates from year to year, but is 18 per cent on average over the 6 years.

variable was calculated using surveys response on five questions relating to the unpredictability of consumer demand and the speed of technological obsolescence in the firm's industry.<sup>30</sup> Since these variables are constructed as an average of the responses over the period 2001 to 2006, we are implicitly assuming that these strategies are time-invariant. This is no doubt a limitation of our analysis, but one which is unavoidable given the size of the survey dataset.

Similar to other studies using survey-based data (see for example, Arvanitis 2008), the majority of variables used in this paper do not rely upon a single survey question since it is well-known that this is unlikely to adequately measure the underlying latent construct of interest. Since we do not want to use a data reduction method that will exclude cases if there is a missing response to one of the questions, we construct each variable as the mean of all non-missing items.<sup>31</sup>

## **V. Results and analysis**

In this section, we first report the results on the magnitude of abnormal profits. Due to the presence of heteroscedasticity (see equation 7 in the appendix), we estimate the model using weighted least squares (WLS) with 2,689 firm dummy variables. We presents results for two models – one in a static setting (Model 1) and one in a dynamic setting (Model 2). The results are presented in Table 2.

With respect to the explanatory variables: we found that almost all variables are statistically significant and signed in accordance with a priori expectations. The main exception to this is company age, which is negatively signed. Our expectation was that this would be positively associated with profits since it captures the accumulated returns to reputation. However, once all other factors are controlled for, the opposite turned out to be correct – older companies have lower abnormal profit. Trended patent and

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<sup>30</sup> Further detail on the construction of the *Collusion*, *Efficiency*, *Strategy* and *Uncertainty* variables can be found in Table 7 in the Appendix.

<sup>31</sup> For example, if a constructed variable was the average of 6 items, but one item was missing for a firm, the constructed variable for that firm would be the average of 5 items.

trademark applications were significant and positive in both estimations suggesting a rise in their value over time. Finally, the coefficients on stocks of patents pending (measured as counts) are large and negative in both equations (albeit not significant) which suggest that recent, unexamined patents have a negative effect on company profits.

**Table 2: Determinants of Profits, 1989 to 2006<sup>(a)</sup>**

<b>Explanatory Variables</b>	<b>Model 1</b>	<b>Model 2<sup>(b)</sup></b>
<b>LAGGED DEPENDENT VARIABLE</b>		0.466*** (58.43)
<b>ACCOUNTING ASSETS</b>	0.049*** (23.45)	0.021*** (10.82)
<b>UNMEASURED INTANGIBLE ASSETS</b>		
<b>Patents</b>		
- Total registered patent stocks (days)	0.447*** (2.62)	0.292** (2.06)
- Stock of patents pending	-1391.3 (-0.77)	-1192.4 (-0.73)
- Time × patent applications (trend)	125.1** (2.56)	102.9** (2.21)
<b>Trade marks</b>		
- Total registered trade mark stocks (days)	0.091*** (8.83)	0.031*** (4.50)
- Time × trade mark applications (trend)	49.5*** (3.67)	22.7* (1.91)
<b>Designs</b>		
- Total registered design stocks (days)	-0.120 (-1.02)	-0.105 (-1.18)
- Time × design applications (trend)	107.1** (2.01)	62.1 (1.40)
<b>Other intangibles</b>		
- Company age	-6956.8*** (-3.21)	-4715.4** (-2.39)
<b>Firm dummies</b>	Yes	Yes
<b>Year dummies</b>	Yes	Yes
<b>Estimation method</b>	WLS	WLS
<b>No. observations</b>	19,193	19,193
<b>No. firms</b>	2689	2689
<b>Adj-R<sup>2</sup></b>	0.622	0.697

**Notes:** (a) The dependent variable is gross profit ('000), which has been deflated by the CPI (1989-90=100).  
(b) The instrument used for the lagged dependent variable is the second lag of the dependent variable.  
Z-statistics are in brackets. \* significant at 10% level; \*\* significant at 5% level; \*\*\* significant at 1% level.

For the second stage of the analysis, we extracted the estimated fixed-effects from Table 2 and regressed them against the variables *Collusion*, *Efficiency*, *Strategy* and *Uncertainty*. Since these variables are time-invariant, we model the determinants of abnormal profits as a cross-section rather than an unbalanced panel. Our main interest here is to consider whether there are any systematic associations which might support either the industry-collusion or firm-efficiency hypotheses. The results are presented in Table 3 – each of which corresponds to the results in Table 2. That is, Models 1 and 2 use the estimated fixed-effects extracted from Models 1 and 2 in Table 2. In each case, OLS is used as the method of estimation. We use (firm) and (ind) in Table 3 to indicate whether the variables are measured at the firm- or industry-level respectively.

**Table 3: Determinants of Abnormal Profit<sup>(a)</sup>**

<b>Explanatory Variables</b>	<b>Model 1</b>	<b>Model 2</b>
<b>Accounting assets, <math>\bar{K}_i^A</math> (firm)</b>	0.682** (2.28)	0.643** (2.10)
<b>Uncertainty (firm)</b>	17.556 (0.04)	36.348 (0.09)
<b>Collusion (ind)</b>	239.361 (0.88)	135.441 (0.49)
<b>Efficiency (firm)</b>	90.232*** (14.11)	95.652*** (14.57)
<b>Strategy (firm)</b>		
- Patents	344.285 (1.42)	377.33 (1.52)
- Secrecy	537.293* (1.73)	650.101** (2.04)
- Lead time	-186.451 (0.44)	-257.658 (0.60)
- Organisational complexity	-214.123 (0.51)	-217.253 (0.50)
- Control distribution, brands	-167.567 (0.47)	-164.861 (0.45)
<b>Constant</b>	-2.055 (0.92)	-2.33 (1.02)
<b>Estimation method</b>	OLS	OLS
<b>Observations</b>	447	447
<b>Adj R<sup>2</sup></b>	0.74	0.75

**Notes:** (a) The dependent variable is the estimated fixed-effects extracted from Table 2.

Z statistics in brackets, \* significant at 10% level; \*\* significant at 5% level; \*\*\* significant at 1% level

It is important to bear in mind that, given the cross sectional nature of this analysis, we are not able to determine whether specific behaviours by firms have *caused* high or low profits or are the *result* of high or low profits. Nevertheless, our results show that abnormal profits were not associated with either felt uncertainty or industry concentration, *ceteris paribus*. To the extent that 2-digit industry concentration captures the potential for (tacit) collusion, our results do not provide any support for the *industry-collusion* theory of abnormal profits. At the same time, the results provide strong support for the *firm-efficiency* hypothesis since market share had a positive and statistically significant association with abnormal profits. Of course, there is an important caveat to this conclusion since market share represents returns to improvements in efficiency, strategy and rent-seeking behaviour. Thus, market share is not a perfect proxy for firm efficiency. Nevertheless, our results stand in sharp contrast to previous research which typically does not find a statistical association between market share and abnormal profits (see Slade 2004).

Over and above the firm-efficiency effect, there is some evidence supporting the role of current strategic use of appropriation mechanisms. In particular, our results show that firms which use secrecy as a means of protecting their competitive advantage are more likely to be in receipt of abnormally high profits. In contrast, those firms that rely on lead time, organisational complexity and control over distribution and branding, exhibit no advantage. Given the explosion in the use of patents and other forms of IP protection in recent years, one might have expected to see that patents have a strong positive effect on generating abnormal profits. However, this conjecture is not reflected in our results. This may be a result of the empirical fact – borne out in numerous studies such as Levin et al. (1987) and Cohen et al. (2000) – that patents are relatively ineffective mechanisms in appropriating returns to innovative investment.

Previous empirical examinations of the determinants of abnormal profits have often used simple industry and firm dummies as explanatory variables. The relative magnitude of the dummy variables is then used to provide support for one of the competing explanations of abnormal profits (see Slade 2004). One of the contributions of our study is that, by introducing continuous measures for each of the explanatory variables, we are able to calculate the marginal effects of each variable on abnormal profits, which we present in Table 4. The marginal effect for each variable is presented in terms of a change from one standard deviation below its mean, to one standard deviation above its mean. This unit-free measure permits us to compare the implied relative importance of the different explanatory variables.<sup>32</sup> These marginal effects show quite clearly that the firm’s market share has the largest impact on abnormal profits. In contrast, secrecy and patenting efforts are together only about a fifth the level of the market share effect.

**Table 4: Marginal Effects of Determinants of Abnormal Profits**

<b>Explanatory Variables</b>	<b>Marginal Effect<sup>(a)</sup> (Model 1)</b>
<b>Uncertainty (firm)</b>	957
<b>Collusion (ind)</b>	25,253
<b>Efficiency (firm)</b>	486,481
<b>Strategy (firm)</b>	
- Patents	36,044
- Secrecy	51,415
- Lead time	-14,728
- Organisational complexity	-15,758
- Control distribution, brands	-14,293

**Notes:** (a) Marginal effect of each explanatory variable is calculated as the change associated with an increase from one standard deviation below the mean to one standard deviation above the mean.

Interpretation of these results on the effectiveness of specific management strategies for profit seeking firms must proceed with care. As we note above, the major problem here is distinguishing causality from correlation. Our results on secrecy are a good example: one plausible interpretation is that

<sup>32</sup> However, note that the absolute units of the abnormal profits variable have no meaning per se.

secrecy *causes* above-normal profits, but a valid alternative interpretation is that firms performing well turn to secrecy as a means of safeguarding their dominant position in the market. In the alternative explanation, above-normal profit *causes* secrecy. Given the cross-sectional nature of the second-stage estimation, we can not definitively determine which way the causality runs.

### **Comparison with Other Approaches**

One of the limitations of most studies in this genre has been their inability to find a measure of profitability that accounts for intangible investments.<sup>33</sup> To see whether our new approach can explain anything new (over and above existing approaches), we contrast our results with a separate set of results using one of the most commonly-used accounting measures of profit – Return on Equity. That is, we use the same set of explanatory variables as above, but use a different measure of profits.

Table 5 presents the two sets of regressions using our explanatory variables against Return on Equity (averaged over the period 1990-2006) as defined in company accounts. The first important to note is that neither the *Collusion* or *Efficiency* variables are statistically significant. Secondly, we note that only one of the variables relating to *Strategy* (organisational complexity) is statistically significant. Finally, the explanatory power of these estimations is much lower compared with the estimations using the intangible capital-adjusted measure of profits. The adjusted-R<sup>2</sup> for the Return on Equity estimations was close to zero (see Table 5), while the adjusted-R<sup>2</sup> for the intangible-adjusted profit equations is in the 0.70 to 0.75 region.

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<sup>33</sup> Hawawini et al. (2003) recognise that Return on Equity or Return on Assets is problematic and devise two other measures; market to book value and return on assets with an adjustment for the cost of capital. However, we do not believe these are measures of profitability. The former is just a measure of intangible capital – as the literature spawned by Griliches (1981) attests – and the latter does not account for intangibles at all.

**Table 5: Determinants of Abnormal Profit<sup>(a)</sup>**

<b>Explanatory Variables</b>	<b>Model 1</b>
<b>Uncertainty (firm)</b>	31.0 (1.34)
<b>Collusion (ind)</b>	5.48 (0.36)
<b>Efficiency (firm)</b>	-0.13 (-0.74)
<b>Strategy (firm)</b>	
Patents	-35.9 (-2.63)
Secrecy	2.12 (0.12)
Lead time	-4.39 (-0.19)
Organisational complexity	46.9* (1.97)
Control distribution, brands	11.3 (0.56)
Constant	0.05 (0.45)
<b>Observations</b>	447
<b>Estimation method</b>	OLS
<b>Adj-R<sup>2</sup></b>	0.01

**Notes:** (a) The dependent variable is return on equity.  
Z statistics in brackets, \* significant at 10% level; \*\* significant at 5% level; \*\*\* significant at 1% level.

## **VI. Conclusions and policy implications**

In this paper, we re-examine the two main competing hypotheses of the determinants of abnormal profits using a new way to measure profits. Instead of using accounting-based measures of profitability – such as return on equity or price-cost margins – we derive estimates of persistent abnormal profits from a model which relates realised profits to both tangible and intangible capital. Our proxy variables for intangible capital include multiple indicators of product and process innovations as well as variables to capture the broader dimensions of marketing and organisational capital. The resultant estimated firm-specific fixed-effects, which we interpret as estimates of abnormal profits, are used to test for their association with industry barriers to entry (and potential collusive price setting), size-related firm-efficiency factors or strategic use of different appropriation mechanisms.

In the first stage of our estimation, we find that accounting for unmeasured intangible assets does matter for the estimation of profits. In the second stage, we found support for the *firm-efficiency* theory but not the *industry-collusion* theory. Support for the strategy variables on how firms appropriate their profits was however selective and not necessarily in keeping with *a priori* expectations. Our main finding here was that firms that rely on secrecy as the primary way to appropriate profits were associated with higher profits.

Our results have some implications for public policy, in particular industry regulation. Since there is no evidence that increased industry concentration (perhaps via mergers and acquisitions) facilitates collusive behaviour within an industry, forestalling the rationalisation of industry is likely to impose considerable efficiency costs upon society. That is, the opportunity costs of foregone efficiency appear to outweigh the benefits of preventing collusion. The obvious caveat to this is that more analysis should be conducted on concentration and market share in 3-digit ANZSIC industries since one of the weaknesses of our approach is that we are only able to measure concentration and market share at the 2-digit level. Nevertheless, our results suggest that regulators need to do more than simply analyse concentration ratios when they are adjudicating on proposed mergers and acquisitions.

The implications for managerial policy depend on whether the results in Table 3 represent causation or mere correlation. To the extent that they reflect causal relationships, our results suggest that the most successful route to persistent above-normal profits is through judicious use of secrecy. However, it should be pointed out that the availability of a panel data set would enable more authoritative conclusions on this issue.

## Appendix

Table 6 presents the industry distribution of firms included in the second stage of the empirical analysis – the determinants of abnormal profits equation – and compares this with the total population of organisations in IBISWorld which reported a profit (which is the relevant sampling frame). It reveals that the sample of organisations used in our analysis has an industry distribution that is roughly comparable with its population. Notable differences are a larger sample in manufacturing and a smaller sample in finance and insurance.

**Table 6: Distribution of Sample and Population, by Industry**

Industry	Sample of firms (%)	Population of firms reporting a profit (%)
Mining	3.8	6.8
Manufacturing	34.9	24.6
Electricity, Gas and Water Supply	4.1	2.8
Construction	3.8	4.1
Wholesale Trade	19.7	15.7
Retail Trade	5.4	7.3
Accommodation, Cafes and Restaurants	0.6	0.9
Transport and Storage	4.8	5.8
Communication Services	1.0	1.3
Finance and Insurance	4.1	11.7
Property and Business Services	12.4	14.5
Health and Community Services	3.8	3.0
Personal and Other Services	1.6	1.7
<b>Total</b>	<b>100.0</b>	<b>100.0</b>

Table 7 provides a descriptive summary of the sources of data used to construct the variables in Tables 2-5. Where data were obtained from the Melbourne Institute Business Survey, we have paraphrased the questions used as items in the construction the variables. In a limited number of cases, data were used from published ABS and ASIC. The latter are indicated in the description column.

**Table 7: Variable Definitions**

Variable	Description	Survey questions / statements where applicable
<b>Company Age</b>	Determined via the ASIC company registration database	
<b>Uncertainty (firm)</b>	A 5-item, 7 point scale measuring variability in demand, competitors, technologies	The organisation changes its marketing practices extremely frequently; The rate of obsolescence is very high (as with some fashion goods); Actions of competitors are unpredictable; Consumer demand is unpredictable; The production/service technology often changes in a major way.
<b>Collusion (ind)</b>	<p>The Herfindahl concentration index has been constructed using the formula for each industry</p> $H = \sum_{g=1}^r n \times m^2$ <p>where <math>g</math> is the size ordered group of firms, and <math>r</math> is the total number of groups in each industry, <math>n</math> is the number of firms in each groups (in the ABS data this is 4 for the top groups) and <math>m</math> is the ratio of sales for the group to total sales for the industry. The data source is ABS Cat. No. 8140.0.55.001 Industry Concentration Statistics.</p>	
<b>Efficiency (firm)</b>	Total company sales as % of sales in company's 2-digit industry. Average for the period 1996-97 to 2002-03. Total company sales are collated from IBISWorld and the average sales in each industry is collated from the ABS (Cat No. 5206006).	
<b>Strategy (firm)</b>		
Patents	2-item, 7-point scale questions measuring the effectiveness of patents for that firm	How effective are patents for protecting the competitive advantages of new or improved products and processes that your organisation has invented?
Secrecy	2-item, 7-point scale questions measuring the effectiveness of patents for that firm	How effective is secrecy for protecting the competitive advantages of new or improved products and processes that your organisation has invented?
Lead time	4-item, 7-point scale questions measuring the effectiveness of lead time and moving quickly down the learning curve for that firm	How effective are lead time and moving quickly down the learning curve for protecting the competitive advantages of new or improved products and processes that your organisation has invented?
Organisational complexity	4-item, 7-point scale questions measuring the effectiveness of organisational know how, capabilities and product and production complexity	How effective are organisation know how and capabilities; product and production complexity for protecting the competitive advantages of new or improved products and processes that your organisation has invented?
Distribution and branding	4-item, 7-point scale questions measuring the effectiveness of control over distribution and brands for that firm	How effective is control over distribution and brand names and marketing for protecting the competitive advantages of new or improved products and processes that your organisation has invented?

**Sources:** ABS, Australian Securities and Investment Commission (ASIC), IBISWorld, Melbourne Institute Business Survey 2001 – 2006.

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