

**Size, profitability and survivorship:  
the performance of large scale enterprise in Australia**

Simon Ville

University of Wollongong

and

David Merrett

University of Melbourne

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# **Size, profitability and survivorship: the performance of large scale enterprise in Australia**

## *Abstract*

Are large firms more profitable and is their survival rate better than smaller ones?

This paper uses Australian time series and cross-sectional data at the firm level for the first half of the twentieth century to address these questions. We compare the return on equity for the largest 20 companies in a database with the remaining 405 firms for the period 1901-21, and then calculate the comparative attrition rates over the following forty years. The top 20 firms as a whole were more profitable, though with somewhat mixed individual performances, and had lower attrition rates over the following 40 years than smaller firms. Thus, larger firms, on average, performed better and were more effective at sustaining their relative standing.

*Keywords:* profitability, survivorship, firm size, big business, mobility barriers, industry lifecycles, business history.

## **1. CONCEPTUAL BACKGROUND**

Three key measures of a firm's performance are its profitability, size and survivorship (Cassis & Brautaset 2003 p. 5). Profitability, however measured, indicates the rate of return achieved on a company's assets and investment funds. A firm's ability to expand in size can be a reflection of its success as earnings are reinvested and external

funding can be easily attracted. Survivorship intimates an ability to develop sustainable competitive advantages beyond initial opportunities such as an economic upturn or the early growth stages of an industry.

A pertinent issue is the extent to which these three measures of performance reinforce one another to provide an unequivocal identification of a nation's business champions. Thus, would we expect our largest firms also to be among the most profitable and enduring? The conceptual literature provides some contrasting viewpoints.

The traditional neoclassical view of the firm was based on the assumption of a U-shaped long run average cost curve (LRAC), wherein economies of scale became diseconomies beyond a certain growth point, particularly as a result of the inefficiencies of managing a large and complex organization.<sup>1</sup> Subsequently, industrial economists have identified various sources of increased efficiency that effectively unbend or significantly extend the U-shaped LRAC. These have included technology sets with much greater scale and scope economies and organizational restructures that accommodate much larger bureaucratic enterprises. Critical mass brings other advantages such as the alleged superior efficiency of internal capital and labour markets. In addition, size provides the resources to help firms build for the future, such as through research laboratories and the ability to attract strategic thinkers. Where growing size is associated with increased market share, the opportunity exists to exert strategic influence over competing firms and those located contiguously along the value chain. Thus, we might expect to find higher returns in

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<sup>1</sup> Small firms may also be successful through the pursuit of niche markets.

the most concentrated industries reflecting the structure-conduct-performance paradigm that emphasizes industry level influences on profitability (Feeny & Rogers 1998, appdx 1).

The lifecycle, or competitive market, view holds that the rate of return declines over the life of a firm as imitators compete away its initial source of above-average profitability that brought the firm into existence in the first place. This traditional perspective stretches back at least to the colourful analogies of Marshall's 'trees in the forest' and Schumpeter's 'creative destruction' (Marshall 1920; Schumpeter 1934). It receives some support from more recent managerial theories of the firm, which hold that large enduring firms come under the control of managers pursuing self-interested goals (Marris 1964). Finally, organizational inertia is seen to hold back mature firms (Levinthal, 1992). An alternative literature follows the idea that above average firm profits persist over time and that there is no convergence to a competitive rate of return. Michael Porter has theorized why firms within the same industry will pursue different strategies that generate different rates of return that persist over time. The insight here is that firms are able to sustain their prime mover advantages (by staking a claim on strategic assets such as patents or natural resources) or through developing corporate capabilities over time (such as product differentiation and optimal governance), both of which serve as mobility barriers that insulate firms from competition *within* as well as from outside the industry, and thus enable the firm to maintain its leadership position (Porter 1979, pp. 214-17; Mueller 1977; Penrose, 1959). Empirical evidence of recent experience provides some support for this view (Mueller 1990; Maruyama & Odagiri 2002).

Business history provides evidence of the longer run experience of firms, particularly the manner in which pioneer firms expanded from the late nineteenth century into national and international behemoths to become household names. American companies in such manufacturing industries as steel, automobiles, chemicals, and electricity yielded immense scale and scope economies of manufacturing and distribution, intangible competences such as branding, and in turn designed organizational structures within which to manage these activities effectively (Chandler 1990).<sup>2</sup> Evidence also exists to suggest a willingness to use their size and market power against smaller companies, justifying active competition policy by Federal governments from the last decade of the nineteenth century (Freyer 1992; Gabel 1994). While the broad historical story of these companies is clear, less well known is whether their size dominance was also reflected in above average rates of return justifying the substantial absorption of investible funds by these giants.

Australia also experienced the seeds of modern corporate development around the beginning of the last century although with a very different sectoral focus and on a different scale from the United States. While Australia's leading resource companies such as BHP, Dalgety and CSR were minnows compared with the likes of American manufacturers like US Steel and Ford, they were more dominant within the local economy and individual industries than their American counterparts. This dominance alone justifies an investigation into the performance of Australia's leading corporations. Such work is facilitated by firm level profitability data for Australia before 1922, which complements broader work on the scale and nature of big business.

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<sup>2</sup> For an international comparative study see A. D. Chandler, F. Amatori and T. Hikino eds *Big Business and the Wealth of Nations* (Cambridge UP, 1997).

In this paper, therefore, we draw on historical time series and benchmark cross-sectional data to measure each of these performance indicators during the formative years of the growth of large scale enterprise at the beginning of the twentieth century. The relationship between size and profitability may be analysed for a particular year but a time series allows us to average out volatility in the annual rate of return. In addition, a meaningful measurement of survivorship requires data over a longish period of time.

Specifically, we compare the rate of return on equity of the largest 20 companies during 1901-21 in a database of 425 public companies with the rest of the database. The largest firms represent about 5 per cent of the population of companies for whom information is available and are defined by a cross-sectional calculation for 1910 based on asset size. We then track these 20 companies through subsequent size cross-sections for 1930 and 1952 to calculate their survival rate within this peak cohort and compare it with survivorship rates among other groups of companies.

Section 2 explains the data and methodology and section 3 reports the results. In section 4 we analyse the broader implications and section 5 concludes.

## **2. DATA AND METHODOLOGY**

The paper draws on two recently derived major historical datasets at the firm level: one is an annual measure of firm profitability for 1901-21, and the other

calculates the largest firms for benchmark years. By combining the two datasets we can compare the performance of the largest 20 firms with a much broader population of firms and assess how well large, highly profitable firms sustain their ranking over time.

### **Profitability**

The rate of return is calculated for up to 279 companies annually for the period 1901-21. There are a variety of methods for calculating profitability, depending upon the data available, perspectives on the theory of profitability, and the investigative goals being pursued, which include the return on assets, capital, or equity, the EBDIT (earnings before depreciation, interest and taxation) margin, and the holding return (Gow and Kells 1998; Arnold 1999; Capie & Billings 2001; Cassis & Brautaset 2003). The available historical data focuses our investigation on the measurement of the return on shareholder equity. This is derived from declared profit, net of taxes and interest charges, as a percentage of total shareholder funds as reported annually by each company. Total shareholder funds consist of the paid up capital of ordinary shares plus accumulated reserves, which is assumed to include current retained earnings.<sup>3</sup> Thus, our calculation of nominal profitability can be expressed formally as:

$$\text{RoE (\%)} = [\text{NP}/\text{TSF}]100$$

where RoE is return on equity, NP net profits, TSF total shareholder funds.

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<sup>3</sup> Preference shares are generally excluded from the definition of shareholder funds. It is a much debated point whether they constitute part of the equity of a firm or should be regarded as a form of financial liability. For example redeemable preference shares are generally regarded as a liability.

Our source is the *Australasian Insurance and Banking Record* (hereafter *AIBR*), which commenced publication in 1877 reporting on market news and company performance in the financial sector. By the 1890s it had expanded into a relatively broad based investment journal, which included brief annual financial statements for most major Australian and New Zealand companies. Our profit figures for 1901-21 were constructed company by company, a laborious process involving 279 Australian companies annually by 1921. From the outset this included companies from all of the main ANZSIC divisions, although there is no indication of the basis on which companies were included.<sup>4</sup> The *AIBR* has been widely cross-checked against other primary and secondary sources (*Australian Investment Digest*; Ville and Merrett 2000; Nash). The number of companies included grew regularly from 111 in 1901 to 265 by 1919, when it represented about 50 to 60 per cent of known public companies.<sup>5</sup>

The limited disclosure requirements of companies at this time raises questions regarding the accuracy of reported information and its consistency between companies. Indeed, there are some inconsistencies in the manner in which profits and total shareholder funds were declared. In some cases, these were simply stated in aggregate form, in others these figures had to be calculated from various data. Attempts to falsify profits or the keeping of hidden reserves could create a mismatch between actual and reported returns. Australian trading banks followed British practice in smoothing profits through transfers in and out of ‘inner reserves’ until 1979 (Arndt & Blackert 1977; Burroughs 1992). Similar practices occurred at brewers

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<sup>4</sup> We opted to exclude insurance companies from our data because of the problems interpreting declared ‘underwriting profits’.

<sup>5</sup> This estimate is based on a number of considerations particularly several lists of all known public companies published in the interwar period: Jobson, A. and Pooley, A. M. 1930, *The Digest Year Book of Public Companies of Australia and New Zealand*, Jobson's Publications, Sydney.

Tooths, where, prior to a major change in the Companies Act in 1961, understatement or smoothing commonly occurred through the development of secret reserves (Wilson & Shailer 2004). There is no indication, however, as to how widespread such practices were in Australia, nor whether their incidence would bias results over the course of two decades in such a way as to invalidate the large dataset used here. Evidence has been produced for Britain and Germany of underdeclaration of profitability in good years and overdeclaration in poor years, creating a cyclical smoothing effect rather than an upward or downward bias (Arnold 1999; Napier 1991; Spoerer 1996).<sup>6</sup>

### **Company size**

There are many criteria for measuring the relative size of firms including assets, output, sales, paid up and market value of capital, or labour force, but none provide an unambiguous result. Enumeration by workforce size can be misleading for cross-industry comparisons where different capital-labour requirements exist; output or sales figures are only helpful where they can distinguish value added. Equity capitalisation represents aggregate ownership claims on the company and is most accurate where it gives market rather than book values. Exogenous factors driving equity markets create volatility that would not be reflected in other measures. Asset measurement relies upon consistent accounting and disclosure practices on balance sheets, and in some sectors, notably finance, it can produce an inflated picture of size through loan policies that have made the company asset rich.

Historical measurements of changes in firm size encounter significant data collection problems. Since detailed data for many firms are not extant, summary

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<sup>6</sup> For a more detailed discussion of the methodological issues for this dataset see Ville and Merrett 2006.

published data, usually annual financial reports, must be used. Before 1945 this rarely included information on company workforces or value added in production. Most scholars, therefore, have used capitalisation or assets data (Hannah 1983; Wardley 1991; Schmitz 1995; Fruin 1992; Chandler 1990). The use of different methodologies means that figures on absolute firm size must be analysed circumspectly, although the broad parameters for comparison remain valid.

In analysing Australian firms, asset size was adopted as the unit of measurement, being the most readily available data across the time period under consideration. Incorporation of businesses became increasingly common from the late nineteenth century. Company law required the publication of a balance sheet and a profit and loss account. The asset approach enabled the inclusion where possible of those firms whose shares were unquoted or rarely traded. The accuracy of share capitalisation as a form of measurement of firm size, especially in the early years, is compromised by the belated development of Australian stock markets and many firms' heavy reliance upon bank debt. Identifying and ordering the leading firms for a single year is a long process, and so we followed the methodology used by previous business historians of undertaking this exercise for periodic benchmark years each about a generation apart. In this case 1910, 1930, 1952 are the relevant years.<sup>7</sup>

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<sup>7</sup> Fleming, Merrett and Ville pp. 4-5 for a more detailed explanation of the methodology. Because of the asset rich nature of financial institutions, which inflates their apparent importance, they have been excluded from this list. The inclusion of the three largest banks of the period (Bank of New South Wales, Union Bank of Australia and Commercial Banking Company of Sydney) would have had negligible impact on the results since their average return on equity across the period was a small 0.37 per cent higher than the smallest three companies in the top 20 (Chillagoe, Carlton & United Breweries, and Tooth). The full data results also include lists for 1964, 1986 and 1997.

### 3. RESULTS

#### **Firm size and profitability**

The profitability results are presented in table 1. The average rate of return across the entire period is presented in an unweighted (mean of the annual averages) and a weighted (according to aggregate profits and shareholder funds across the period) form.<sup>8</sup> It reveals that the top 20 firms as a group outperformed the rest. On an unweighted basis, the annual return on equities was 1.68 per cent higher, on a weighted basis the difference was 1.47 per cent. Expressed proportionately, the top 20 firms as a group outperformed the rest by 17.8 and 15.2 per cent per annum respectively. One and two-tailed t-tests computed at the 5 per cent level indicated the results to be statistically significant (see appendix).

[Insert Table 1 here]

On a year to year basis, the top 20 firms outperformed the database in 17 of the 21 years. The four years (1902, 1903, 1920 and 1921) in which the top 20 underperformed were all ones of poor returns as a whole. Conversely, the two years in which the relative performance of the top 20 was greatest (1906 and 1907) were years of above average performance as a whole. Most likely, this greater volatility reflects the predominance among Australia's leading business enterprises of resource companies, a sector known for its cyclical fluctuations.

[Insert Table 2 here]

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<sup>8</sup> All annual averages are taken from the aggregation of profits and shareholder funds to minimise the impact of outliers results from individual companies if rates of return themselves were averaged.

Table 2 reports the top 20 results by company. It reveals some variability of performance at the company level: 11 out of 20 beat the database across the period. The average annual return on equity varied from 18.96 to -0.62 per cent with a coefficient of variation of 0.42. Relative size within the top 20 was not significant but sectoral location was more important. The impact of the miners is confirmed by the fact that the top 3 performers were all from this sector, Sulphide Corporation, BHP, and Mount Morgan. Conceivably, Chillagoe which was the 20<sup>th</sup> company by rank and the only one to register an overall loss, might be regarded as an outlier. We only have data for the company for half of the period, it was badly managed and overcapitalized, and its smelters were out of action throughout the mining boom period of 1914-20 (Kennedy 1982). Excluding this company would substantially narrow the profit range among the cohort from 19.58 to 12.98 per cent, marginally increase the mean rate of return by 0.11 per cent and increase its proportionate margin over the unweighted database average from 17.8 to 19.2 per cent.

### **Firm size and survivorship**

Defining 'survival' as remaining in the top 20 by size by the next benchmark year, we find that 11 of the top 20 firms of 1910 were still there by 1930, of which 7 were above the database average performance for 1901-21. Extending another generation to 1952, 8 still remained of which 5 were above average performers. We can compare these inter-censal survival rates of 55 and 40 per cent respectively with the lower rates for the top 100 companies as a whole of 47 and 27 per cent respectively. An alternative approach would be to compare the survival rate of our leading 20 companies with the final quintile of the top 100, thus comparing same

sized cohorts but whose companies were of very different size.<sup>9</sup> In this case, the final quintile (companies ranked 81-100) had much lower survival rates within their own cohort of 35 and 5 per cent respectively through to 1930 and 1952. These results are reported in table 3.

[Insert Table 3 here]

A firm's departure from the top 20 might be on account of going out of business, its reduced relative size, or a change in ownership through mergers and acquisition. Of the 9 firms missing from the top 20 by 1930, 6 were due to a decline in relative size taking them below this elite group. Most had not fallen far with Australian Estates at rank 21 and Carlton United Breweries at 23, the latter rejoining the top 20 by 1952. A further two firms had experienced a change in ownership and one had gone into liquidation. Both acquired firms went into public ownership in somewhat exceptional circumstances, Chillagoe by the Queensland government in 1920 after years of struggling, and Melbourne Tramway when the Melbourne and Metropolitan Tramways Board took over its routes in 1917. For the subsequent period to 1952, all departures were due to reduced relative size. Sectoral influences were again strong, with 5 of the 12 departures by 1952 being land companies and pastoral agents.

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<sup>9</sup> The top 20 firms were on average 11 times larger than the bottom 20.

#### 4. DISCUSSION

Our results provide some evidence to support the notion that, on average, large firms outperform small ones and, additionally, are better placed to sustain their relative standing in positions of strength and leadership. While the largest companies as a whole achieved above average profits throughout most of the period, the significant company to company variation within the group suggests other factors were also at work. Industry effects may be divined by the poor performance of several of the stock and station agent companies coming off one of the worst droughts in Australian history between 1896 and 1902. Miners, on the other hand, benefited from some exceptionally good years – in 7 seven years the rate of return of this sector was half as large again as the national average, and in a further two years was more than double. The years leading up to and including the First World War were particularly fruitful with the enhanced demand for metallic ores for armaments and engineering, and, on the supply side, major advances in mining technology. Nonetheless, inter-sectoral variations in average profitability across the full database for 1901-21 occurred in the much narrower range of 7 to 13 per cent than among our corporate leaders

As Table 2 reveals, there were also substantial inter-firm variations among the largest firms within individual industries. Firms at the top of the list performed considerably better than the industry average, while those further down underperformed in their industry inspite of their size. However, it should of course be borne in mind that these are based upon broad ANZSIC divisions rather than more specific industries. For most ‘industries’, their smallness in this period makes it difficult to compare different firms. Exceptionally, the large mining and wholesaling sectors can be commented

upon in more detail. In mining, performance differences may be explained either by the serendipity of a very high risk industry or through different corporate strategies. BHP led the mining industry and remained one of the largest and most successful firms in twentieth-century Australia. Its successful strategies particularly included forward vertical integration into steel manufacturing in 1915 and subsequently into related downstream products (Fleming, Merrett & Ville 2004 p. 104). The other two high performing miners, Sulphide Corporation and Mount Morgan, have also featured prominently in the history of the industry, most recently being absorbed into multinational resources firm Rio Tinto. Within the stock and station agent industry, the key rural segment of wholesaling, the firms that performed best during 1901-21 went on to lead that sector for much of the twentieth century: Elder Smith, Goldsbrough Mort, and Dalgety dominated market share and geographic expansion (Ville 2000, pp. 29-30, 43).

Feeny (2002) in a cross-sectional study of Australian firms during 1994-7 found that industry explanations, such as market share and concentration, had little impact on firm profitability. Similarly, Hannah's longitudinal study of global enterprises, 1912-95, found more variation *within* industries than *between* them (Hannah 1999). The significance of industry effects may lie less with a static structure-conduct-performance perspective and more with the impact of structural change in the Australian economy over time with the rise, peak, then decline of many key sectors and industries. The relative expansion of the manufacturing sector in the middle decades of the twentieth century pushed many resource companies out of the leading cohort. Significantly, it was those resource companies that responded to these 'punctuated equilibriums' by vertically integrating then diversifying into manufacturing that often survived and indeed prospered, most notably BHP, CSR, and

British Tobacco. This presents a similar picture to sustaining companies overseas, notably an ability to shift strategy and resources rapidly in response to an altered operating environment (Chandler 1990, chs 5, 6; Hannah 1999). While environmental shifts may undermine the prime mover advantages of some firms, others appear to have developed generic corporate capabilities, or ‘mobility barriers’ in Porter’s terminology, that were not easily eroded by such changes.

The lower turnover revealed among large Australian firms supports the idea of their ability to adapt strategically to a changing environment. However, it would be misleading to portray the Australian corporate economy by the mid twentieth century as one of stable oligopolies. International comparisons suggest higher turnover rates among Australian big business than those from other nations (Fleming, Merrett, Ville 2004 p. 38. Hannah (1998, p. 63) shows that internationally 20 of the top 100 global firms in 1912 were still in that list in 1995 compared with 6 for Australia’s domestic 100. He calculates that the ‘quarter life’ of the 1912 global 100 firms (the time taken for a quarter to disappear from that list) was 33 years, while it took only 20 years to reach almost a ‘half life’ (9 lost out of 20) among the Australian top 20 (Hannah 1999). Moreover, we calculated that half of the top 20 firms of 1910 remained in the national lists of Britain and America of 1948, that is a half life of around 38 years (calculated from Chandler 1990 pp. 638-86). It should be noted that most comparative studies, exclude some or all of the volatile resources sector. Nonetheless, the smallness of the Australian economy limited the ability of most of the largest firms to maximise the efficiencies and competitive advantages associated with growth – unable to achieve the scale economies in production needed to compete internationally, none were to be found in the top 100. Moreover, the constant threat of multinational entry, encouraged by rising tariffs, and the reducing natural protection

offered by distance as transport and communications were radically improved made Australian markets highly contestable if not entirely competitive.

## 5. CONCLUSION

This paper is set within the context of two theoretical standpoints addressing large firm performance, one is the question of profitability and the other that of survivorship. Each standpoint is contested terrain and it is rare for the two questions to be addressed simultaneously. Most of the literature is concerned either with entity or industry aspects of firm size that impact on profitability *or* whether a firm's performance diminishes over time. This may be due to the fact that the empirical focus of one is cross-sectional and the other longitudinal.

The business history of large scale enterprise provides an appropriate setting for considering these two traditions in tandem. In many nations, particular firms have risen to positions of strength over longish periods of time. They have done so initially by grasping strategic assets that have provided them with the first mover advantages to dominate a particular industry, and then built on this over time by developing corporate capabilities such as through scale and scope economies, product loyalty, optimal organizational design, and the broad exercise of strategic influence, all of which create mobility barriers that make it difficult for other firms in an industry and new entrants to have an impact.

Our study of Australia is focused on the earlier decades of the growth of large scale enterprise that attracted the attention of the likes of Marshall and Schumpeter. It provides some support for the view that larger firms tend to be more profitable and

better at sustaining their relative standing over time. However, successful challengers do emerge from time to time and this reflects positively on the opportunity for contestability. Indeed, turnover rates amongst big business appear to have been higher than overseas, a fact probably not unrelated to the activity of well-resourced multinationals often emanating from much larger economies with historical and cultural connections to Australia, notably Britain and the United States. Long term successful firms in Australia have been spread across many sectors, which suggests that entity rather than industry characteristics predominate. However, dynamic industry effects mattered in an economy that featured significant sectoral shifts across the twentieth century. It was the flexibility, perhaps the product of learning, to shift resources between sectors in a timely manner that characterized most of Australia's 'corporate leaders'.

## ACKNOWLEDGEMENTS

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**Table 1. Size and profitability, 1901-21**

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	Mean (%)	
<b>W20</b>																						11.14	
<b>U20</b>	10.22	6.25	6.21	7.88	11.62	16.42	14.72	10.65	10.73	12.42	13.44	13.79	12.22	12.42	12.76	12.64	12.15	12.65	10.44	8.01	5.81	11.12	
<b>WDBX20</b>																						9.67	
<b>UDBX20</b>	7.28	6.86	7.24	7.31	8.64	8.85	10.82	8.59	8.92	9.72	11.19	12.30	11.73	10.53	10.10	10.71	11.04	10.50	9.35	9.24	7.28	9.44	
<b>Wdf</b>																						1.47	15.2
<b>Udf</b>	2.94	-0.61	-1.03	0.57	2.98	7.57	3.90	2.06	1.81	2.70	2.25	1.49	0.49	1.89	2.66	1.93	1.11	2.15	1.09	-1.23	-1.47	1.68	17.8

Note:

- W20: Weighted top 20
- U20: Unweighted top 20
- WDBX20: Weighted database excluding top 20
- UDBX20: Unweighted database excluding top 20
- Wdf: Difference between W20 and WDBX20
- Udf: Difference between U20 and UDBX20

**Table 2. Profitability and survivorship of top 20 companies**

<b>Top 20 companies by assets, 1910</b>	<b>ANZSIC Division</b>	<b>1910 rank</b>	<b>Average RoE, 1901-21 (%)</b>	<b>RoE Relative to ANZSIC Division Mean</b>	<b>Top 20 in 1930</b>	<b>Top 20 in 1952</b>
Sulphide Corporation	B	16	18.96	5.76	↓	
Broken Hill Propriety Co	B	12	17.01	3.81	Y	Y
Mount Morgan Gold Mining Co	B	15	16.49	3.29	O	
Scottish Australian Investment Co	E	13	14.56	5.69	↓	
British Tobacco Co (Australia)	C	2	14.48	2.89	Y	Y
D. & W. Murray	F	17	12.24	1.82	↓	
Tooth and Co	C	20	12.16	0.57	Y	Y
New Zealand and Australian Land Company	E	5	11.81	2.94	Y	↓
Goldsbrough, Mort and Co	F	8	11.74	1.32	Y	↓
Dalgety and Co	F	1	11.01	0.59	Y	Y
Elder, Smith and Co	F	10	9.93	-0.49	Y	Y
DATABASE AVERAGE			9.67			
Mount Lyell Mining and Railway Co	B	9	9.63	-3.57	↓	
Carlton and United Breweries	C	19	9.50	-2.09	↓	Y
Australian Gas-Light Co	D	11	9.03	-0.47	Y	↓
Colonial Sugar Refining Company	C	3	8.81	-2.76	Y	Y
New Zealand Loan and Mercantile Agency Co	F	4	7.47	-2.95	Y	Y
Australian Estates and Mortgage Co	E	7	7.33	-1.54	↓	
Australian Mercantile, Land and Finance Co	F	6	7.29	-3.13	Y	↓
Melbourne Tramway and Omnibus Co	I	14	5.98	-2.59	L	
Chillagoe Co	B	18	-0.62	-13.82	0	
<b>TOTAL</b>			<b>11.14</b>			

Notes:

1. Key. Y = remained in top 20; ↓ = fall in relative size; L = liquidation; 0 = change in ownership
2. For ANZSIC division definitions see <http://www.abs.gov.au/>

**Table 3. Comparative survival rates within top 100 companies (%).**

<b>1910 Cohort</b>	<b>1930</b>	<b>1952</b>
Top 20	55	40
Top 100	47	27
Bottom 20	35	5

Note. Survival within top 20, top 100, and top 100 respectively.

Appendix 1.

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*t-Test: Two-Sample Assuming Unequal Variances*

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	<i>UDBX20</i>	<i>U20</i>
Mean	9.44	11.12
Variance	2.64	8.23
Observations	21	21
df	32.00	
Computed t statistics	-2.33	
P(T<=t) one-tail	0.0131	
t Critical one-tail	1.69	
P(T<=t) two-tail	0.0261	
t Critical two-tail	2.04	

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U20: Unweighted top 20  
UDBX20: Unweighted database excluding top 20