The Performance of Small and Medium Enterprises: An Overview Using the Growth and Performance Survey*

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Abstract

This paper provides an overview of the performance of small and medium private enterprises (SMEs) using the growth and Performance Survey. Three aspects of performance are considered: profitability, productivity and innovation. SMEs are defined as enterprises with less than 100 employees and their performance is contrasted with the performance of firms with more than 100 employees. Comparisons are made at the 2 digit ANZSIC level. SMEs as a group tend to have higher median profitability (than large firms) in manufacturing. SMEs tend have lower median labour productivity and higher median capital productivity than large firms. This reflects the fact that SMEs have lower capital to labour ratios. In addition, SMEs seem to rely more on leased capital.

Key words: performance, small and median enterprises, profitability, productivity, innovation.

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1 Introduction

The performance of small and medium enterprises (SMEs) is of interest for a number of reasons. Lattimore et al (1998) state that small businesses in Australia account for around 44.2% of employment and 34% of GDP.[1] In addition, some of today's SMEs may be the large, successful firms of tomorrow. The ability of some SMEs to develop and grow is therefore of crucial concern to the welfare of the economy. This view of SMEs is firmly rooted in a dynamic view of the economy. In contrast, much of the traditional economic theory and empirical work is concerned with a static world, where market conditions have "settled" into a stable equilibrium. Reconciling the 'traditional, static' viewpoint with the 'dynamic, dis-equilibrium' viewpoint is a major task. This paper provides some preliminary analysis on SME performance to investigate this issue. In particular, it compares the profitability, productivity and innovativeness of SMEs with the performance of large firms.

The empirical analysis contained in this paper is made possible by a new ABS data set of firm performance (normally called the Growth and Performance Survey, GAPS, although also called the Business Longitudinal Survey, BLS). This survey tracks the performance of firms over time, beginning with around 9,000 firms in 1994/95. This paper only considers data from the first year of the survey (subsequent papers will utilise the panel aspect of the survey data set). As will become clear, there is substantial information in the initial year of data and this paper can be thought of as a precursor to more advanced analysis of the panel of firms.[2]

The structure of the paper is straightforward. Each section considers one aspect of performance, namely, profitability, productivity and innovation. The beginning of each section provides a brief overview of the variables used and the issues considered. Then each section provides statistics that compare the performance of SMEs to large

[1] These figures are for 1994-95 and are based on the same data base that is analysed here. These statistics define small business as a business with less than 20 employees or less than 100 employees in manufacturing. The SME definition used in this paper is any firm with less than 100 employees located in any sector.

[2] Further information on the GAPS data set is contained in Industry Commission / DIST (1997).

firms. These comparisons are made at the two digit ANZSIC level. The final section concludes.

2 Profitability

2.1 Introduction

In this section three different measures of profitability are analysed. These are return on assets, the price-cost margin and the EBDIT margin. Full definitions of these measures are shown in Table 1. One of the reasons for considering profitability is that it can be linked to the theoretical idea of monopoly power. The Lerner index of monopoly power is given by

$$L \quad \frac{(P - MC)}{P} \ , \qquad [1]$$

where P equals output price and MC is marginal cost. As monopoly power increases the index approaches 1, while the existence of perfect competition implies a value of 0. In practice we do not have data on marginal costs and so an approximation is used, namely, that marginal costs equal average variable costs. Using this approximation we can write

$$L' = \frac{(P \quad AVC)}{P} \cdot \frac{Q}{Q} = \frac{TR \quad TVC}{TR} = \frac{\pi}{TR} \ . \qquad [2]$$

The price cost margin (PCM) in Table 1 is our closest measure of this modified Lerner index. The EBDIT margin can also be considered an approximation to this index and is included here since it is a commonly used profitability measure.

Table 1 Definitions of profitability ratios

Ratio	Definition
Price cost margin	Value of production less variable costs / value of production
Return on Assets (RoA)	Earnings Before Depreciation Interest and Tax /total assets
EBDIT Margin	Earnings Before Depreciation Interest and Tax /total income

Note: 'value of production' is sales of goods and services plus change in stocks. 'Variable costs' are defined as wages, superannuation, workers' compensation, pay roll tax, purchases of materials and energy and motor vehicle expenditure.

One of the issues investigated in this paper is whether the profitability of small firms differs from large firms. The Lerner index suggests that this may be the case if larger firms have greater market power. A more theoretical approach to this issue is to consider a simple model of oligopolistic behaviour. Consider that there are j ($j < \infty$) firms competing in a market. The inherent difficulty with predicting the profits of any single firm is that its profits depend on the actions of the other firms. One way to model this situation is to assume an 'output response' of other firms to the action of firm j. This can be written dQ_j/dq_j, where Q_j refers to the market output not including firm j's, and q_j refers to firm j's output. The expression dQ_j/dq_j is known as the firm's *conjectural variation*. Given this it can be shown that the PCM of a firm is[3]

$$L \quad \frac{(P \quad MC)}{P} \quad \frac{s_j}{e} \quad 1 \quad \frac{dQ_j}{dq_j} \Big| , \qquad [3]$$

where s_j is the firm's market share and e is the market price elasticity of demand. In a given market, therefore, if all firms have similar conjectural variations, we would expect to see larger firms have a higher PCM. If the conjectural variation differs across firms this will also influence profitability. One assumption would be that small firms expect $dQ_j/dq_j=0$ (i.e. their actions do not cause reactions from others – a Cournot assumption), whereas large firms may collude, suggesting that $dQ_j/dq_j>0$.

[3] For example, see Scherer and Ross (1990, p230).

This again would suggest that large firms have higher price cost margins. These results can be termed the 'traditional' or 'static' viewpoint.

As might be expected, the above results are too simplistic for a number of reasons. First, the above model assumes that there exists a well defined market which consists of a homogenous product or service. In reality, we do not have data on 'markets', only proxies for this based on industrial classifications. Within an industrial classification there are likely to be a range of products which are not close substitutes. Second, the measures of profitability are unlikely to be consistent across firms (for example, large firms may use complex accounting methods to understate their profits, see Schmalensee, 1989). Thirdly, some authors argue that large firms may experience the X-inefficiency associated with Harry Leibenstein (see Frantz, 1997, for a discussion) due to their size and diversity. Lastly, the traditional model assumes that the market is static in the sense that the firms have constant costs and technology is constant. In reality, markets are constantly evolving and some firms may experience high short run profits as they capitalise on cost or technological advantages. Even though these advantages may influence any firm, there is an argument to suggest that some SMEs are the efficient and dynamic firms which are able to make high profits by being 'ahead of the market'. This 'dynamic' view of the world suggests therefore that SMEs as a group may experience higher profitability than large firms with, in particular, a sub-set of 'dynamic' SMEs experiencing high profitability.

2.2 Differences in profitability across firm sizes

To investigate these issues, Tables 2 to 5 show summary statistics by firm size for all the firms in the GAPS data set. The tables show that there is an incredible range of profitability (the maximum and minimum values in each size group are given). Closer inspection of the data suggests that a relatively small number of observations have extreme values. These values are likely to be due to a number of reasons including survey error, the volatility of firm profitability and variations in accounting policy. Given this large variance caused by outliers, the median and inter-quartile range (IQR) are used as measures of the typical value and dispersion. The median values show that the smallest firms have the highest profitability for all the measures of profitability. However, in each case the inter-quartile range is highest for the 1-4

employee group of firms. These results lend some weight to the 'dynamic' view of firm performance; however, there are likely to be substantial variations in profitability across industries which implies the analysis should consider an industry breakdown.

Table 2 Price cost margin by firm size

Firm Size	Maximum	Minimum	Median	Inter-quartile range
		Percentages (%)		
1-4	100	-20900	32.5	40.8
5-19	100	-6875	25.5	27.3
20-99	100	-2680	25.9	28.9
100+	97	-62000	26.9	26.7

Table 3 Return on assets by firm size

Firm Size	Maximum	Minimum	Median	Inter-quartile range
		Percentages (%)		
1-4	17200	-5400	20.5	52.9
5-19	12800	-34650	17.9	31.7
20-99	33900	-2260	14.0	20.3
100+	538	-852	15.5	15.4

Table 4 EBDIT margin by firm size

Firm Size	Maximum	Minimum	Median	Inter-quartile range
		Percentages (%)		
1-4	130	-1475	10.5	24.9
5-19	1598	-1166	6.9	13.7
20-99	94	-35877	6.1	10.2
100+	1696	-50275	8.3	13.3

2.3 Differences in profitability across firm sizes and industry

The traditional theory discussed above suggests that profit varies according to market conditions; specifically, market share, price elasticity of demand and conjectural

variation. One method of controlling for – to some extent – the last two factors is to consider profitability at the industry level.[4] Table 5 shows the median and IQR for the price cost margin for SMEs and large firms by 2-digit ANZSIC. SMEs are defined as firms with effective full time employment of between 1 and 100.[5]

Looking at the median of the price cost margin (PCM) it is clear that there are substantial differences between industries. For SMEs the lowest median PCM is 15.9% for the 'Basic Material Wholesaling' (45) industry, in comparison, the lowest PCM for the large firms is 6.9% for the 'Motor Vehicle Servicing and Retail' (53). At the other extreme, the highest median PCM for the SMEs is 61.2% (Sport and Recreation (93)) and, for the large firms, 76.3% for the 'Motion Picture, Radio and TV Services' (91) industry.

The inter-quartile range (IQR) is a measure of dispersion that places no weight on the extremes of the distribution. Differences in profitability within industries may be due to firm level differences in cost, market share or conjectural variation. However, it is also likely that the 2-digit ANZSIC categorisation does not define a market accurately: firms within a 2-digit ANZSIC may face very different market conditions and profit opportunities. Carrying out the analysis at the 3-digit level is possible but this would restrict further the number of firm observations in each industry. Table 5 shows that the IQR is relatively large for both the SMEs and large firms in many industries.

[4] Obtaining estimates of the price elasticity of demand is difficult (see Long and Ravenscraft, 1984, for an example). Conjectural variation is normally proxied by industry concentration measures, which are unlikely to measure collusion accurately.

[5] Effective full time equivalent is defined as working proprietors + managers + full time employees + 0.42 (part time employees). The latter fraction is used since this represents the average relative hours of part time employees (see Rogers, 1998a, footnote 2).

Table 5 Price cost margin, small vs. large, by industry

Industry	SMEs		Large		
2 digit Anzsic	Median	IQR	Median	IQR	
	Percentage (%)				
Coal Mining (11)	na	na	56.9	18.8	
Metal Ore Mining (13)	54.0	22.7	70.3	7.8	H
Other Mining (14)	53.4	24.7	75.1	44.4	H
Services to Mining (15)	52.1	35.7	26.7	34.7	
Food, Beverage, Tobac. Man (21)	26.5	24.8	23.1	18.7	
TCF Manufacturing (22)	28.8	26.4	21.0	21.4	
Wood and Paper Man. (23)	26.5	22.8	34.9	18.7	H
Printing, Pub. & Rec. Media (24)	36.6	22.2	33.2	15.7	
Petroleum, Coal, Chemical (25)	28.0	19.3	25.2	14.7	
Non-Metallic Mineral (26)	32.9	24.6	44.4	16.6	H
Metal Product Manufacturing (27)	25.1	20.5	22.5	9.9	
Machinery and Equipment (28)	26.6	22.5	19.8	10.3	
Other Manufacturing (29)	27.7	28.9	22.0	15.1	
General Construction (41)	35.1	35.6	19.4	25.8	
Construction Trade Services (42)	36.3	42.9	17.5	4.4	
Basic Material Wholesaling (45)	15.9	19.0	11.9	8.9	
Machinery, Motor Whole. (46)	17.6	13.2	18.3	21.4	H
Personal, Household Whole. (47)	15.3	19.1	18.3	23.1	H
Food Retailing (51)	19.7	16.8	37.3	61.4	H
Personal, Household Retail. (52)	20.1	17.7	24.9	11.9	H
Motor Vehicle Retail.and Ser (53)	18.5	24.0	6.9	6.4	
Accomm., Cafes & Rest. (57)	35.7	27.4	46.2	25.7	H
Road Transport (61)	35.8	39.5	67.2	28.6	H
Services to Transport (66)	24.0	58.2	34.7	10.5	H
Services to Finance & Insur. (75)	39.0	42.7	46.5	34.2	H
Property Services (77)	50.8	37.8	29.3	139.1	
Business Services (78)	39.6	41.8	29.9	29.3	
Motion, Radio & TV Ser. (91)	43.1	40.3	76.3	55.2	H
Sport and Recreation (93)	61.2	36.9	62.9	25.1	H
Personal Services (95)	43.8	35.1	47.9	49.5	H

Note: The median and inter-quartile range (IQR) are reported for all industries in the GAPS data set with more than 10 firms. A "H" in the far right column indicates the median value for the large firms is higher than the median for SMEs. Finance (73) and Insurance (74) are omitted through out the paper since their accounting procedures, and survey questions, do not always coincide with other firms.

A major reason for compiling Table 5 is to compare SME and large firm profitability within industries. To recap, the traditional view of profitability suggests large firms should be more profitable, while the 'dynamic' view suggests some SMEs will be more profitable. The far right hand column of the table contains a "H" if the large firms have a higher median PCM than the SMEs. The results show a mixed story. In

manufacturing, only two out of the 9 industry divisions have a higher median profitability for large firms. Equally, SMEs do relatively well in construction (42 and 45). In contrast, for most of the other industries large firms seem to have higher profitability.

Table 6 shows a similar set of statistics as Table 5 using the return on assets (RoA) measure of profitability. Again, it demonstrates that there are differences in rates of return across industries and also that within industry variation is important. The comparison of median RoA for SME and large firms shows a similar pattern to that in Table 5. In manufacturing, SMEs have higher median RoA while in other sectors large firms often have the advantage. Overall, the results for both PCM and RoA suggest that the 'dynamic' model may be more appropriate in the manufacturing sector, while the 'traditional' view may apply to the non-manufacturing sector. Appendix A contains a similar table for the EBDIT margin. This shows a different result: the median EBDIT margin of large firms is almost always higher than the median for SMEs, even in the manufacturing sector.

Table 6 Table return on assets, small vs. large firms (by industry)

Industry	SMEs		Large firms		
2 digit ANZSIC	Median	IQR	Median	IQR	
	Percentages (%)				
Coal Mining (11)	10.7	10.2	15.6	9.1	H
Metal Ore Mining (13)	27.5	56.6	21.0	15.4	
Other Mining (14)	10.5	18.8	16.6	0.8	H
Services to Mining (15)	39.5	41.0	8.5	169.8	
Food, Beverage, Tobac. Man (21)	14.8	26.3	12.6	19.9	
TCF Manufacturing (22)	17.1	39.5	15.6	20.6	
Wood and Paper Manu. (23)	21.4	36.5	16.2	13.7	
Printing, Pub. Rec. Media (24)	19.5	31.9	18.2	11.1	
Petroleum, Coal, Chemical (25)	15.7	23.2	15.6	11.3	
Non-Metallic Mineral (26)	21.7	37.8	20.5	7.6	
Metal Product Manufacturing (27)	18.1	30.6	14.4	19.9	
Machinery and Equipment (28)	17.8	25.8	17.5	18.5	
Other Manufacturing (29)	18.7	42.6	11.2	23.6	
General Construction (41)	13.3	64.0	17.3	14.5	H
Construction Trade Services (42)	40.0	94.4	20.3	14.1	
Basic Material Wholesaling (45)	13.8	20.8	8.5	6.1	
Machinery, Motor Whole. (46)	12.5	22.7	13.7	14.1	H
Personal, Household Whole. (47)	13.0	26.0	13.5	12.5	H
Food Retailing (51)	20.8	38.1	15.3	13.2	
Personal, Household Retail. (52)	14.3	38.5	10.8	10.1	
Motor Vehicle Retail.and Ser (53)	16.2	24.5	30.9	24.8	H
Accomm., Cafes & Rest. (57)	11.4	24.0	8.7	11.9	
Road Transport (61)	29.5	49.3	22.1	4.7	
Services to Transport (66)	3.5	14.4	17.6	30.7	H
Services to Finance & Insur. (75)	11.8	36.4	10.0	28.6	
Property Services (77)	10.1	21.4	16.6	17.9	H
Business Services (78)	29.0	63.3	21.0	18.6	
Motion, Radio & TV Ser. (91)	22.3	35.8	13.8	45.0	
Sport and Recreation (93)	7.5	33.6	13.3	14.0	H
Personal Services (95)	36.0	66.2	16.5	27.1	

3 Productivity

3.1 Introduction

This section calculates and analyses labour and capital productivity. The calculation of labour productivity follows Rogers (1998a). In brief, a measure of value added is divided by the number of effective full time employees to form labour productivity.

Value added is defined as sales (net of change in stocks) less materials purchases and motor vehicle expenses.[6] The determinants of labour productivity are complex, however, a simple Cobb-Douglas production function can illustrate some of the basic factors,

$$V = AK \ \ L^{\beta} \ , \qquad [4]$$

where V is value added, K is capital, A is level of 'technology', and L is labour. This functional form assumes a constant elasticity of substitution between capital and labour (which is equal to 1, see Griliches and Ringstad, 1971, for a discussion). Rearranging [4] we can write labour productivity (V/L) as

$$\frac{V}{L} = AK \ \ L^{\beta-1} = A \ \frac{K}{L} \qquad [5]$$

where the far right has assumed that there are constant returns to scale (i.e. $\alpha+ \ =1$). Equation [5] suggests that labour productivity depends (partly) on the capital to labour ratio and the level of technology. Since we would expect these to vary across industries, Table 7 shows the median and IQR for labour productivity by industry using the same SME and large firm categorisation as above. The table illustrates a number of results: (1) that the median labour productivity varies substantially across industries, at both the SME and large firm level, (2) there is still substantial variation within industry and size categories, and (3) that in almost all industries the median labour productivity of SMEs is lower than the median for large firms. The latter point suggests that the capital to labour ratio may vary between SMEs and large firms.

[6] Effective full time equivalent is defined in footnote 5 above.

Table 7 Labour productivity, small vs. large firms, by industry

Industry	SMEs		Large Firms		
2 digit ANZSIC	Median	IQR	Median	IQR	
	$ 000's per employee				
Coal Mining (11)	145.4	2533.3	289.8	115.4	H
Metal Ore Mining (13)	77.4	59.5	342.9	262.2	H
Other Mining (14)	86.8	32.0	1034.3	1651.8	H
Services to Mining (15)	90.1	169.7	76.0	120.0	
Food, Beverage, Tobac. Man (21)	44.3	40.6	76.0	89.8	H
TCF Manufacturing (22)	33.7	42.0	66.5	85.6	H
Wood and Paper Man. (23)	35.5	33.6	98.7	52.3	H
Printing, Pub. & Rec. Media (24)	55.9	50.7	88.7	37.7	H
Petroleum, Coal, Chemical (25)	56.6	43.9	114.6	81.4	H
Non-Metallic Mineral (26)	43.8	46.3	135.7	109.6	H
Metal Product Manufacturing (27)	44.9	33.3	79.2	43.9	H
Machinery and Equipment (28)	47.0	34.0	71.6	30.0	H
Other Manufacturing (29)	38.6	29.4	71.6	38.4	H
General Construction (41)	63.2	88.2	93.2	82.4	H
Construction Trade Services (42)	38.2	37.7	55.1	6.8	H
Basic Material Wholesaling (45)	50.9	47.2	76.2	50.6	H
Machinery, Motor Whole. (46)	59.0	43.9	104.4	106.2	H
Personal, Household Whole. (47)	56.6	61.6	90.6	42.1	H
Food Retailing (51)	29.5	21.4	38.8	18.5	H
Personal, Household Retail. (52)	45.6	38.0	60.6	39.2	H
Motor Vehicle Retail.and Ser (53)	37.4	29.3	93.1	16.5	H
Accomm., Cafes & Rest. (57)	39.7	37.1	77.6	88.1	H
Road Transport (61)	42.0	36.0	177.9	108.7	H
Services to Transport (66)	37.0	26.0	78.2	50.5	H
Services to Finance & Insur. (75)	44.9	55.5	173.8	48.9	H
Property Services (77)	31.7	65.2	67.8	125.7	H
Business Services (78)	42.0	41.5	72.7	77.7	H
Motion, Radio & TV Ser. (91)	52.9	71.4	144.7	324.3	H
Sport and Recreation (93)	37.9	28.1	87.1	62.7	H
Personal Services (95)	27.0	20.2	53.0	17.4	H

3.2 Capital productivity

To be able to consider the capital to labour ratio and capital productivity we need to be able to measure the capital stock employed by the firm. In the same way that labour productivity is a *partial* measure of productivity, a capital productivity measure can be defined as the ratio of value added to capital. Normally, capital stock (or the flow of services from the capital stock) is defined only with respect to *owned* capital. Any leased capital – although this represents employed capital – is often

treated differently, with the leasing cost simply subtracted from sales in the same way as material costs. In the limit this implies a firm with no owned capital will have an undefined capital productivity (i.e. value added divided by *zero* owned capital). An alternative method, which is used here, is to impute a capital stock value to leased assets. This can be done since the GAPS has data for a firm's rent, leasing and hiring expenses. Imputation requires an assumption about the life of the asset that is being leased. Here it is assumed that leased assets have an expected life of 20 years (implying a straight line depreciation of 5% per annum).[7] Given this, the imputed value of capital stock of leased assets is given by

$$\text{Imputed stock} = \frac{\text{lease expense}}{[1/20 \quad r]}$$

where r is the discount rate.[8]

The imputed capital stock value of leased capital is then added to the book value of owned capital (as reported in the balance sheet[9]) to yield a total capital stock.

Before we calculate a capital productivity using the derived capital stock figure it is interesting to compare the ratio of owned to (imputed) leased capital stock. This is done in Table 8. Again, the median and IQR for the ratio are shown by industry and firm size classifcations.

[7] The Bureau of Industry Economics (1988) contains a discussion of the imputation method. They have data on the breakdown of owned capital into machines and buildings and assume that leased assets have the same composition. Machines are assumed to have a life of 13 years, buildings 40 years. With no data on leased asset composition we simply assume a life of 20 years.

[8] The discount rate is taken as the 10 year treasury bond rate average for June 1994 (9.63%).

[9] This is defined as plant, equipment, property and the average work in progress for the year.

Table 8 Ratio of owned to leased assets, small vs. large, by industry

Industry	SMEs		Large firms		
2 digit ANZSIC	Median	IQR	Median	IQR	
Coal Mining (11)	13.2	0.0	7.7	43.7	
Metal Ore Mining (13)	1.1	1.1	6.4	48.2	H
Other Mining (14)	4.5	3.9	100.0	0.0	H
Services to Mining (15)	4.4	7.0	1.7	2.8	
Food, Beverage, Tobac. Man (21)	1.1	5.9	10.6	40.9	H
TCF Manufacturing (22)	0.6	1.0	5.3	12.7	H
Wood and Paper Man. (23)	0.6	2.6	11.9	62.6	H
Printing, Pub. & Rec. Media (24)	0.8	1.3	4.3	6.4	H
Petroleum, Coal, Chemical (25)	1.2	3.1	4.7	7.5	H
Non-Metallic Mineral (26)	1.2	2.7	22.4	41.9	H
Metal Product Manufacturing (27)	0.8	2.2	11.8	44.8	H
Machinery and Equipment (28)	0.9	1.9	4.6	5.6	H
Other Manufacturing (29)	0.6	0.8	4.0	2.7	H
General Construction (41)	0.6	1.9	2.6	2.7	H
Construction Trade Services (42)	0.6	1.4	0.9	2.4	H
Basic Material Wholesaling (45)	1.4	2.9	2.3	3.2	H
Machinery, Motor Whole. (46)	0.9	1.8	3.7	6.6	H
Personal, Household Whole. (47)	1.2	2.1	2.6	9.5	H
Food Retailing (51)	0.3	0.7	0.5	0.4	H
Personal, Household Retail. (52)	0.6	0.8	1.6	3.5	H
Motor Vehicle Retail.and Ser (53)	0.4	0.9	1.9	1.3	H
Accomm., Cafes & Rest. (57)	0.3	3.3	7.5	56.9	H
Road Transport (61)	1.0	4.4	3.0	2.0	H
Services to Transport (66)	0.2	0.4	0.2	2.5	H
Services to Finance & Insur. (75)	0.3	1.5	0.0	7.9	
Property Services (77)	0.4	2.7	2.2	9.7	H
Business Services (78)	0.2	0.8	0.5	1.1	H
Motion, Radio & TV Ser. (91)	0.7	1.2	2.0	23.4	H
Sport and Recreation (93)	0.3	18.2	10.5	59.3	H
Personal Services (95)	0.2	0.4	1.5	5.7	H

Table 8 shows that for most of the industries the median ratio of owned to leased capital for SMEs is less than 1 (i.e. they rely *more* on leased capital than owned capital). In contrast, for large firms, almost all the industries have a median above 1. This said, the IQR values indicate that there is substantial variation within industry-firm size groupings. A greater reliance on leased capital implies less capital tied up in fixed assets, possibly indicating greater flexibility and also, perhaps, the fact that smaller firms have less access to finance.

A further issue discussed above was the capital to labour ratio. To recap, the fact that SMEs had lower labour productivity than large firms suggests they employ less capital per worker. Table 9 shows the median and IQR, by industry and firm size, for the capital to labour ratio. 'Capital' is again defined as the imputed stock value of leased assets plus the book value of owned assets. As can be seen, in almost all industries the median capital to labour ratio is substantially less for SMEs than large firms.

Table 9 Capital to labour ratio, small vs. large, by industry

Industry	SMEs		Large firms		
2 digit ANZSIC	Median	IQR	Median	IQR	
	$000s per employee				
Coal Mining (11)	575.7	2921.0	264.5	494.4	
Metal Ore Mining (13)	166.0	79.3	425.3	695.7	H
Other Mining (14)	119.2	95.5	1929.5	3541.1	H
Services to Mining (15)	35.3	23.3	87.7	66.0	H
Food, Beverage, Tobac. Man (21)	49.0	68.5	74.2	66.9	H
TCF Manufacturing (22)	26.0	38.6	67.8	61.2	H
Wood and Paper Man. (23)	35.6	43.6	111.9	88.1	H
Printing, Pub. & Rec. Media (24)	38.4	36.3	91.1	87.4	H
Petroleum, Coal, Chemical (25)	46.7	62.0	104.3	113.3	H
Non-Metallic Mineral (26)	34.7	59.0	217.4	197.5	H
Metal Product Manufacturing (27)	31.2	41.6	63.5	127.4	H
Machinery and Equipment (28)	34.7	42.0	66.2	48.1	H
Other Manufacturing (29)	28.7	27.6	62.4	49.3	H
General Construction (41)	27.0	117.0	22.1	90.5	
Construction Trade Services (42)	14.1	34.1	26.0	15.4	H
Basic Material Wholesaling (45)	57.9	58.7	114.3	131.3	H
Machinery, Motor Whole. (46)	49.7	54.9	90.9	105.3	H
Personal, Household Whole. (47)	50.0	74.8	97.1	125.4	H
Food Retailing (51)	55.1	64.9	52.2	53.6	
Personal, Household Retail. (52)	69.4	84.0	112.1	117.9	H
Motor Vehicle Retail.and Ser (53)	48.8	58.7	104.5	12.4	H
Accomm., Cafes & Rest. (57)	80.8	122.8	110.5	189.0	H
Road Transport (61)	25.5	47.8	81.0	17.5	H
Services to Transport (66)	26.8	40.8	41.4	18.4	H
Services to Finance & Insur. (75)	31.2	64.0	37.4	33.1	H
Property Services (77)	69.0	268.2	196.5	717.9	H
Business Services (78)	17.7	36.2	30.8	62.0	H
Motion, Radio & TV Ser. (91)	26.4	61.0	91.2	144.3	H
Sport and Recreation (93)	26.7	75.4	111.5	76.8	H
Personal Services (95)	36.1	43.1	33.2	81.7	

Table 10 presents similar statistics on the capital productivity. As expected this shows that the median capital productivity for SMEs is higher than the median for large firms. Intuitively, SMEs have relatively low levels of capital combined with relatively high amounts of labour, hence measured output per unit of capital is high.

Table 10 Capital productivity, SME vs. large, by industry

Industry	SMEs		Large firms		
2 digit ANZSIC	Median	IQR	Median	IQR	
	Value added per $ of capital				
Coal Mining (11)	0.72	0.73	0.61	1.04	
Metal Ore Mining (13)	0.37	0.24	0.72	0.68	H
Other Mining (14)	0.91	1.97	0.91	0.81	H
Services to Mining (15)	2.52	3.16	0.36	0.99	
Food, Beverage, Tobac. Man (21)	0.87	1.07	0.99	0.88	H
TCF Manufacturing (22)	1.41	2.25	1.39	1.07	
Wood and Paper Man. (23)	1.25	1.41	1.09	0.59	
Printing, Pub. & Rec. Media (24)	1.43	2.17	0.94	1.38	
Petroleum, Coal, Chemical (25)	1.20	1.35	1.00	0.55	
Non-Metallic Mineral (26)	1.30	1.34	0.88	0.35	
Metal Product Manufacturing (27)	1.42	1.68	1.25	0.77	
Machinery and Equipment (28)	1.44	1.76	1.32	0.96	
Other Manufacturing (29)	1.38	1.44	0.97	0.81	
General Construction (41)	2.31	5.49	1.31	3.95	
Construction Trade Services (42)	2.61	6.91	1.64	1.43	
Basic Material Wholesaling (45)	0.91	0.96	0.71	0.24	
Machinery, Motor Whole. (46)	1.13	1.42	1.08	1.99	
Personal, Household Whole. (47)	1.15	1.29	0.95	0.57	
Food Retailing (51)	0.61	1.18	0.84	0.38	H
Personal, Household Retail. (52)	0.60	0.95	0.78	0.60	H
Motor Vehicle Retail.and Ser (53)	0.89	0.94	0.89	0.00	
Accomm., Cafes & Rest. (57)	0.51	0.89	0.70	1.33	H
Road Transport (61)	1.68	2.55	2.40	1.16	H
Services to Transport (66)	1.51	2.39	2.08	1.26	H
Services to Finance & Insur. (75)	1.66	3.38	4.64	3.71	H
Property Services (77)	0.38	2.32	0.09	1.18	
Business Services (78)	2.55	5.12	2.00	9.51	
Motion, Radio & TV Ser. (91)	1.62	4.13	1.52	2.52	
Sport and Recreation (93)	1.06	5.05	0.95	0.58	
Personal Services (95)	0.72	0.98	1.66	46.97	H

The substantial differences between labour and capital productivity between SMEs

and large firms suggests that understanding productivity requires a consideration of firm size. SMEs appear to rely more on relatively small amounts of capital and much of this is leased. Large firms have higher levels of capital and more of this is owned by the firm. One possible implication of these observations is that SMEs have the opportunity to improve output by using more capital (although it is likely that SMEs may have too small a scale to utilise some types of capital). These observations also suggest that SMEs and large firms will be affected differently by policy changes that effect labour supply and capital. For example, changes to the tax treatment of owned capital will impact more on large firms.

4 Innovation

The GAPS data set has a number of questions that relate to innovation. A review of these questions is contained in Rogers (1998b). A basic way of assessing whether a firm is 'innovative' is to ask if it has introduced any new products or processes. This allows a simple binary classification of innovators and non-innovators. Table 11 defines the questions used in the survey to form this classification.

Table 11 Questions concerning innovation(s) introduced in GAPS

	Question *YES / NO response required*
Question to manufacturing firms	Did this business in the last financial year develop any new products or substantially changed products or introduce any new or substantially changed processes
Question to non-manufacturing firms	Did this business in the last financial year introduce any new services or significantly change ways of delivering existing services, or introduce any new or substantially changed goods[10]

[10] On the actual survey this question was asked in two parts. First, whether any new services or significantly changed ways of delivering existing services had been introduced and, second, whether any new or substantially changed goods had been introduced. In this paper we have combined the responses so that a 'yes' answer to either question means the service firm is an 'innovator'.

Figure 1 shows the percentages of innovators in each 2 digit ANZSIC industry broken down by SMEs and large firms (using the same 100 employee threshold as above). As discussed in Rogers (1998b), the use of this type of binary classification does not indicate innovation *intensity* and as such may make SMEs appear less innovative (i.e. a small firm may devote substantial *relative* resources to innovation but, due to its size, may only introduce a new product every few years). The figure shows that only three industries have more than 20% of SMEs defined as innovators. These are 'Food, Beverage, Tobacco Manufacturing' (21), 'Petroleum, Coal and Chemical' (25) and 'Machinery and Equipment' (28) – all of which are in the manufacturing sector.

Figure 1 Percentage of 'innovators' by firm size and industry

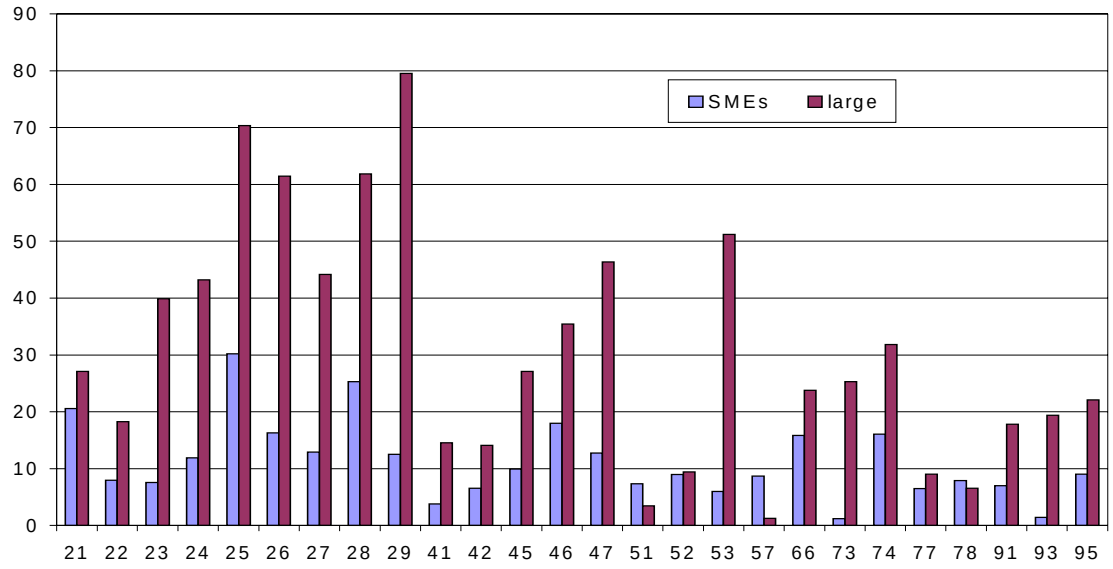
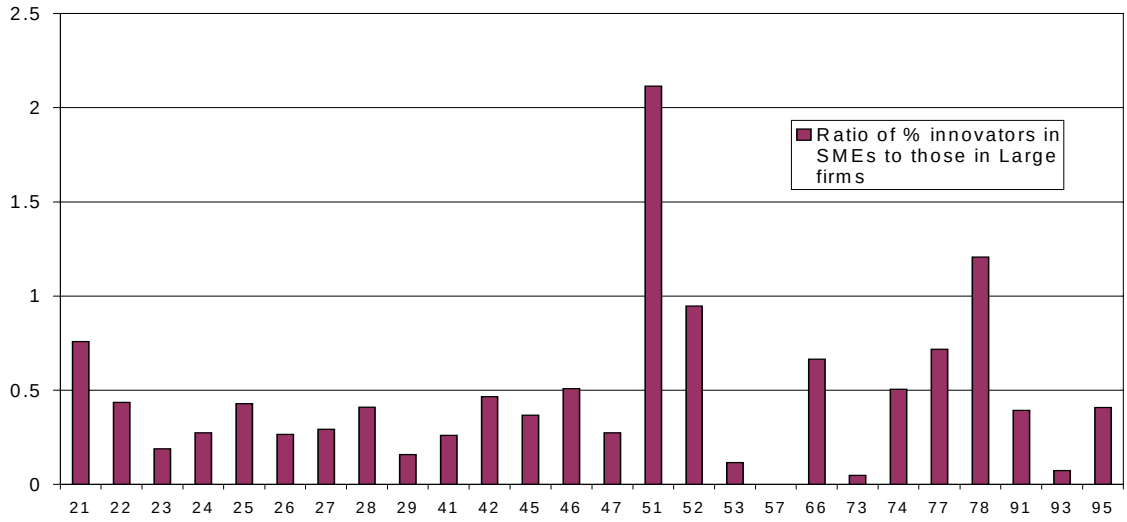


Figure 1 also shows that, within each industry, the SME group almost always have a lower percentage of innovators than does the large firm group. The exceptions to this are for 'Food Retailing' (51), 'Accommodation, Cafes and Restaurants' (57) and 'Business Services' (78). The ratio of SME innovators to large firm innovators is shown more clearly in Figure 2. This figure plots the ratio of the 'percentage of SME who are innovators' to 'percentage of large firms who are innovators' by industry (the figure omits industry 57 to adjust the scale, its ratio is 7).

Figure 2 The ratio of SME innovators to 'large firm' innovators



The GAP survey also includes additional questions on the innovation for the manufacturing sector. The questions are listed in Table 12.

Table 12 Questions concerning innovative activities (manufacturing firms only)

Category	Questions *What was the estimated expenditure on the following categories?*
R&D	R&D performed by this business and payments to others for R&D (exclude R&D done purely as a service to others)
Training	Training of staff associated with the development of new or changed products or processes
Acquisition of technology	Acquisition of patents, trade marks and licences
Tooling-up	Expenditure associated with machinery, equipment or buildings to improve production or produce new/changed products
Marketing	Expenditure associated with new or changed product

Tables 13 to 15 show some summary statistics for three of the expenditures detailed in Table 12. These are for R&D, tooling-up and marketing expenditures. In each case an intensity is defined as the expenditure divided by total revenue. Table 13 shows the median, 90th percentile and 95th percentile for R&D intensity by 2-digit ANZSIC. The most important aspect to notice is that the majority of firms – both SMEs and large firms – spend nothing on R&D (this is shown by the median intensity equaling zero). This is also true of the tooling-up and marketing intensities shown in Table 14 and 15. In other words, innovation – as proxied by these expenditures – is carried out by a minority of firms in a given year.

Table 13 R&D intensity, SME vs. large firms, by industry

Industry	SMEs			Large firms		
2 digit ANZSIC	Median	Percentile		Median	Percentile	
		90th	95th		90th	95th
Food, Bev., Tobac.Man (21)	0.00	0.45	1.95	0.00	1.14	1.42
TCF Manufacturing (22)	0.00	0.00	0.48	0.00	0.09	0.09
Wood and Paper Man. (23)	0.00	0.00	0.00	0.00	0.31	0.57
Printing, Pub. Media (24)	0.00	0.00	1.75	0.00	0.79	0.79
Petroleum, Coal, Chem (25)	0.00	2.76	8.64	0.10	2.60	7.58
Non-Metallic Mineral (26)	0.00	0.79	1.58	0.01	1.05	1.16
Metal Product Manufac(27)	0.00	0.00	1.20	0.00	1.13	1.41
Machinery and Eq. (28)	0.00	5.13	11.11	0.16	3.99	6.09
Other Manufacturing (29)	0.00	0.00	1.85	0.30	1.71	5.29

Since the median value for the intensities is often zero, the tables also show the 90th and 95th percentile (again, if these are zero it indicates that over 90% or 95% of firms in that industry do not report an expenditure). Looking at the values for the 90th percentile for the SME group we can see that industries 21, 25, 26 and 28 have positive values for all of the expenditure types. Therefore, at least 10% of firms in these industries appear to be "innovative" by these indicators. This corresponds to the binary yes/no variable results for the SMEs where these industries had the highest percentage of "innovators" out of the manufacturing industries. Therefore, these industries appear to have a relatively large sub-set of highly innovative and dynamic SMEs.

Table 14 Tooling-up intensity, SME vs. large firms, by industry

Industry 2 digit ANZSIC	SMEs Median	SMEs Percentile 90th	SMEs Percentile 95th	Large firms Median	Large firms Percentile 90th	Large firms Percentile 95th
Food, Bev., Tobac.Man (21)	0.00	0.49	3.43	0.00	0.04	0.23
TCF Manufacturing (22)	0.00	0.00	0.00	0.00	0.26	0.26
Wood and Paper Man. (23)	0.00	0.00	0.00	0.00	3.86	8.13
Printing, Pub. Media (24)	0.00	0.00	0.24	0.00	0.00	7.32
Petroleum, Coal, Chem (25)	0.00	2.25	4.48	0.00	3.06	6.49
Non-Metallic Mineral (26)	0.00	0.72	4.46	0.00	1.80	14.26
Metal Product Manufac(27)	0.00	0.23	2.48	0.00	0.49	1.40
Machinery and Eq. (28)	0.00	1.30	4.35	0.00	0.68	0.81
Other Manufacturing (29)	0.00	0.00	1.80	0.01	1.17	1.46

The comparison between SMEs and large firms in Tables 13 to 15 shows that (1) normally a higher proportion of large firms undertake the various activities, and (2) the large firms often have higher intensities. The latter observation, however, is not true for some of the industries identified above (21, 25, 26 and 28). For example, for industry 21 the SME 95th percentile for R&D intensity is 1.9% (compared to 1.4% for large firms). The SMEs in the 'machinery and equipment' (28) industry always have a higher 90th and 95th percentile than the large firms for R&D, tooling-up and marketing.

Table 15 Marketing intensity, SME vs. large firms, by industry

Industry 2 digit ANZSIC	SMEs Median	SMEs Percentile 90th	SMEs Percentile 95th	Large firms Median	Large firms Percentile 90th	Large firms Percentile 95th
Food, Bev., Tobac.Man (21)	0.00	0.41	1.19	0.00	0.31	1.50
TCF Manufacturing (22)	0.00	0.00	0.00	0.00	0.03	0.09
Wood and Paper Man. (23)	0.00	0.00	0.00	0.00	0.04	0.09
Printing, Pub. Media (24)	0.00	0.00	1.04	0.00	0.02	0.03
Petroleum, Coal, Chem (25)	0.00	0.23	0.90	0.00	0.54	2.14
Non-Metallic Mineral (26)	0.00	0.39	1.75	0.00	0.05	1.12
Metal Product Manufac(27)	0.00	0.00	0.12	0.00	0.05	0.05
Machinery and Eq. (28)	0.00	0.30	1.52	0.00	0.14	0.32
Other Manufacturing (29)	0.00	0.00	0.64	0.15	0.59	0.89

5 Conclusions

This paper has compared the performance of SMEs and large firms. Data for this exercise are taken from the ABS Growth and Performance Survey for 1994-95. Three aspects of performance are considered: profitability, productivity and innovation. There are (at least) two interesting questions that motivate this paper. First, is the process by which high performance is achieved similar for SMEs and large firms? Second, does the distinction between SME and large firms allow an insight into the dynamic performance of the economy? In other words, what evidence is there is of a sub-set of dynamic, high growth performance SMEs? Neither of these two questions is answered here; instead the overview is intended to motivate thought for future research.

In terms of profitability, the traditional theory would suggest that large firms should be more profitable. For our sample we find that this is predominantly true in non-manufacturing industries (this is done by comparing the median return on assets and price cost margin between SMEs and large firms, by 2-digit ANZSIC industry). In contrast, the typical SME in manufacturing appears to be more profitable. The is true for both return on assets and also the price cost margin, although it is not true for the EBDIT margin. As is the case in most applied industrial organisation research, a note of caution is necessary here. While it maybe true that, say, the median return on assets for SMEs is higher than the median for large firms within an industry, there is always considerable variance within both firm size and industry groups. For example, for many industries considered the inter-quartile range is greater than the median.

Labour and capital productivity are calculated for firms by firm size and industry sub-group. Overall, considering each 2-digit industry separately, the typical labour productivity of a SME is lower than a large firm. A major reason for this is that SMEs use less capital per worker than large firms. This means that median capital productivity is higher for SMEs than large firms (i.e. SMEs combine a relatively large amount of labour with a relatively small amount of capital, implying high capital productivity and low labour productivity). Our analysis also suggests that SMEs rely more heavily on leased assets than large firms. These points suggest that the process

by which productivity is increased may be substantially different for SMEs as opposed to large firms.

Measuring the extent of innovation is complex (see Rogers, 1988c). This paper compared the proportion of innovators (as defined by those firms which introduced a new product or process) across firm size and industry. Using this measure of innovation shows that SMEs (as a group) are almost always less innovative than large firms. However, part of this result is likely to be due to the bias that such a binary measure has against SMEs. The ABS GAPS data allows us to calculate R&D, tooling-up and marketing intensities for firms in the manufacturing sector. An intensity is defined as, say, R&D divided by sales, and hence adjusts for firm size. The intensities show that certain industries have a relatively high group of innovative SMEs (these are 'Food, Beverage, Tobacco' (21), 'Petroleum, Coal, Chemical' (25) , 'Non-metallic minerals' (26) and 'Machinery and Equipment' (28)). Indeed, the sub group of innovative SMEs in 'Machinery and Equipment' appears to have higher innovation intensities than large firms in this industry.

Appendix A

Table A1 EBDITM, small vs. large firms. by industry

Industry	SMEs		Large firms		
2 digit Anzsic	Median	IQR	Median	IQR	
	Percentages (%)				
Coal Mining (11)	15.9	12.8	21.7	40.4	H
Metal Ore Mining (13)	16.7	8.3	36.1	18.9	H
Other Mining (14)	7.5	30.5	31.2	35.8	H
Services to Mining (15)	39.5	29.5	2.5	2411.5	
Food, Beverage, Tobac. Man (21)	8.9	17.1	6.6	6.5	
TCF Manufacturing (22)	8.2	14.3	8.6	10.0	H
Wood and Paper Manu. (23)	10.2	16.9	16.6	8.7	H
Printing, Pub. Rec. Media (24)	9.2	14.7	19.9	11.8	H
Petroleum, Coal, Chemical (25)	7.9	14.0	12.2	8.4	H
Non-Metallic Mineral (26)	11.4	21.0	22.5	16.8	H
Metal Product Manufacturing (27)	8.3	12.8	10.8	11.1	H
Machinery and Equipment (28)	8.2	12.8	9.5	10.9	H
Other Manufacturing (29)	8.2	15.4	7.1	13.6	
General Construction (41)	6.5	15.2	6.8	13.3	H
Construction Trade Services (42)	17.5	29.2	10.3	9.2	
Basic Material Wholesaling (45)	6.5	10.1	5.2	5.7	
Machinery, Motor Whole. (46)	4.4	9.5	6.9	6.7	H
Personal, Household Whole. (47)	4.7	7.4	4.6	9.6	
Food Retailing (51)	6.6	10.5	7.1	5.8	H
Personal, Household Retail. (52)	5.4	12.5	4.3	3.9	
Motor Vehicle Retail.and Ser (53)	4.9	14.9	4.2	1.9	
Accomm., Cafes & Rest. (57)	10.0	19.2	8.1	14.3	
Road Transport (61)	14.2	23.5	17.9	3.7	H
Services to Transport (66)	1.3	8.6	10.6	14.9	H
Services to Finance & Insur. (75)	12.4	27.7	8.5	7.2	
Property Services (77)	21.3	51.0	25.6	14.0	H
Business Services (78)	14.1	28.4	6.8	7.1	
Motion, Radio & TV Ser. (91)	13.8	22.8	18.6	26.7	H
Sport and Recreation (93)	10.6	26.7	9.5	17.7	
Personal Services (95)	13.5	29.3	18.2	22.8	H

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