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# Industry Type and Business Size on Economic Growth: Comparing Australia's Regional and Metropolitan Areas

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## **Abstract**

While the main body of literature regarding small-to-medium enterprises is focused on formation and growth, there is insufficient research about the role of both (a) firm size and (b) location on economic growth. The role of firm size and industrial structure on economic growth has been examined by some researchers. Pagano (2003) and Pagano and Schivardi (2000) identified a positive association between average firm size and growth and Carree and Thurik (1999) found evidence that the low number of large firms in an industry could lead to a higher value added growth. The current study attempts to investigate the impact of industry structure and businesses operating within these industries on economic growth. This paper uses “*k*-means” clustering algorithm to cluster Statistical Local Areas. Regression analysis is utilised to identify drivers of economic growth. Preliminary results suggest that size of business may act as a driver of economic growth but the impact could vary based on location.

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**Key words:** firm size, business location, regional and metropolitan, industry structure, clustering

## ***Introduction***

Australian industry has gone through a large structural shift within the last few decades and this has had a different impact on regional and metropolitan Australia. Rapid global and national economic and social change has profoundly affected rural and regional Australia (Commonwealth Department of Transport and Regional Services 2001). Internationalisation and reform to the Australian economy since the 1980s has presented a significant challenge on how to make the nation more competitive and productive (Enright and Roberts 2001). By the 1990s, the structure of many

older national industries had been replaced by more globally integrated businesses networks and systems of production. This industrial restructuring has caused inequality in income generation between regional and metropolitan areas. Such changes and industrial restructuring have left rural and regional Australia scrambling to adapt. According to a report by the Organisation for Economic Co-operation and Development (OECD 2009) inequality among regions increased in about 70 percent of OECD countries. Different industries have experienced different change in their directions. Like many other developed countries, Australia has experienced a decline in the manufacturing and agriculture sectors over recent decades, contrasted by a strong growth in the services sector (Department of Transport and Regional Services Australia 2003). Competition, changing consumer preference and productivity growth, among other factors continue to result in a relative decline in manufacturing (Department of Infrastructure, Transport, Regional Development and Local Government 2009). This has resulted in unemployment in these industries. It seems that in highly advanced economies, industries heavily dependent for inputs on natural endowments have declined resulting in a smaller proportion of employment, unlike the case in many developing economies (Porter 2003). Whereas industries that supply such endowments (for example minerals and energy) have been expanding.

All these changes in industry structure influence economic growth, however this will also vary depending on the impact of other factors such as size of business and location, which is different for regional and metropolitan areas. Insight into the role of industrial structure in economic growth requires a thorough understanding of the role of location (regional, metropolitan) and

size of business. Previous studies in this area are mainly focused on formation and growth (Dobbs, and Hamilton 2007; Mueller et al. 2008; Hudson et al. 2001; Beugelsdijk 2007; Sierdjan 2007; Koster 2007; Armington and Acs 2002), and some studies focus on issues such as an organisation's attitude to change, clustering, success and failure (Walker and Brown 2004; Agarwal and Audretsch 2001; Gray 2002; Feser et al. 2008; Dejardin and Fritsch 2009). There are only some studies that consider location, industry structure and size of business (Okamuro 2006; Pagano 2003). On the one hand these latter studies lack "sufficient granularity" to identify the drivers of economic growth relevant to the industry structure and size of business, and on the other hand there is a gap in the literature in terms of quantitative research to identify the role of industry structure and size of business in economic growth. The present study attempts to address these gaps by considering the impact of size of business and industry structure on economic growth for both regional and metropolitan Australia. Australian Standard Geographical Classification (ASGC-2006), categorises "Major Urbans" as areas having more than 100,000 population. Based on this classification, the study will consider Statistical Local Areas (SLAs) having more than 100,000 population as metropolitan and less than this number as regional.

Understanding the role of industry structure, the location (regional or metropolitan), and size of business is important. A report by Department of Transport and Regional Services Australia (2003) suggests that a region's industry structure is closely tied to the size of its economy. Major cities generally have a very diverse industry structure, which resembles the national distribution of employment across industries, whereas smaller population

centres are much more narrowly based. A region's industry structure is also closely tied to its level of remoteness. For example, the relative importance of employment in agriculture, mining, accommodation, cafes and restaurants rises with increasing remoteness. The relative importance of employment in technology and knowledge-intensive industries tends to decline with increasing remoteness, with a similar pattern evident for manufacturing, property and business services, communication services, wholesale trade, finance and insurance, and cultural and recreational services. Industry structure within which businesses operate plays a significant role in growth of regional economies. Regions with a highly diverse industry structure experience more stable economic performance than other regions (Department of Transport and Regional Services Australia 2003). Distribution of a region's economic activity across industries is considered a major determinant of the region's level of income, the resilience of its local economy and its ability to grow (Department of Transport and Regional Services Australia 2003).

Influence of business location on the local economy is important as well. Some research has been conducted examining the locality of businesses and their impact on economic growth. A study conducted by Lowe and Henson (2005) suggests that in some instances firms are advantaged by their location and at other times they are disadvantaged. In some cases location provides a firm with different sources of advantage to other local firms. Delgado et al. (2010) suggest that those regions which are able to develop wealth creating initiatives (exports) while complementing this with consumption-led growth (driven by population growth) will perform better in economic terms in the

foreseeable future. Blakely (2004) suggests that diverse economic regions do better than those dominated by robust technological sectors. Porter (2003) proposes that regionality needs further consideration. In his study he reveals the importance of regional economies to the overall performance of nations, using data from the US economy to inform this proposal. He suggests that regional analysis must be central to policy formulation in competitiveness and economic development. He also suggests that there is a need for much of economic policy to be decentralised at the regional level. Since determinants of economic performance appear to be in regional areas, national policies will not be sufficient to address this issue. The importance of regions may explain why countries with greater economic decentralisation such as Germany and the US, have been historically successful.

In addition to industry structure and location, size of business plays an important role in business growth, but there is little understanding of the role this size difference has on the way businesses grow (Dobbs and Hamilton 2007). In terms of size, small businesses attract a lot of attention. As a result of change in the industry structure the small business sector has become a vital contributor to the overall performance of the Australian economy (Wijewardena and Tibbits 1999). Small businesses are responsible for around half of all private sector employment (Department of Innovation, Industry, Science & Research 2009) and account for 11 percent of the total number of Australian businesses (Department of Infrastructure, Transport, Regional Development and Local Government 2008). The importance of small business in employment for regional and remote Australia is therefore significant. Whilst in major cities 10 percent of all businesses are small, for inner regional

small business accounts for 12 percent, and for outer regional, remote and very remote it increases to 14 percent of all businesses.

### ***Objective and Methodology of this Study***

The Australian Bureau of Statistics (ABS) classifies size of businesses based on the number they employ. This includes micro business (1-4 employee), small business (5-19 employee), medium business (20-199 employee) and large business (200+ employee). ABS also classifies industries into 18 major industries. Distribution of different size of business within different industry structure as well as locations (regional and metropolitan) is different. This study investigates the impact of industry structure and businesses operating within these industries on economic growth. This impact will be considered on the basis of the size of business in Australia and will be examined based on location (regional and metropolitan areas).

Cluster analysis has been used by contemporary researchers as a method of analysis when the number of observation in a particular field is fairly large (Beer and Maude 1995; Beer and Clower 2009; Freestone et al. 2003). As such cluster analysis is initially used in this study to cluster SLAs based on size of business. This is conducted across industries (16 industries) using data for "Counts of Australian Businesses, Including Entries and Exits, June 2003-June 2007". Since industry structure varies for locations as well as SLAs, the number of SLAs that include different industries varies for both regional and metropolitan areas. For example 630 SLAs in regional areas include the wholesale industry, whereas this number for metropolitan areas is

681. For clustering purposes, different clustering methods are used depending upon the type of the dataset as well as the number of observations and variables in a data. Since there is a gap in the literature in terms of using an efficient method of clustering, the k-means clustering method was adopted. The k-means method chooses k centres (also called centroid) and assigns each point to the cluster whose centre is nearest (Bagirov and Mardaneh 2006). The centre is the average of all the points in the cluster, that is, its coordinates are the arithmetic mean for each dimension separately over all the points in the cluster.

This analysis uses three sets of variables based on the size of business: micro business, small business, and medium business. Large business is not included in the analysis due to the data being too sparse for this category. The hypothesis is that (a) size of business may have different impact on economic growth, and (b) this impact is different for regional as opposed to metropolitan Australia. Regression analysis is then conducted to examine the impact of generated clusters as independent dummy variables. This is considered based on size of business and location (separate for both regional and metropolitan SLAs). The terms 'firm size' and 'size of business' is used interchangeably throughout the paper.

The following steps were taken for collection and preparation of data for analysis:



1. A database was generated using SLA data for “Counts of Australian Businesses Including Entries and Exits, Jun 2003-Jun2007” which was collected and prepared from the Australian Bureau of Statistics (ABS, 2010). This database includes number of businesses of different size for each SLA that encompasses all industry types.
2. Since there is no clear definition of the regional and metropolitan areas, a methodology was set up (steps 3 and 4) to establish a definition of regional SLAs.
3. The Australian Standard Geographical Classification (ASGC-2006), categorises “Major Urbans” as areas having more than 100,000 population. Based upon this, in first stage SLAs having more than 100,000 population were considered as metropolitan;
4. In addition to step 3, a map of the Australian Standard Geographical Classification (ASGC-2009) were used to identify SLAs with less than 100,000 population that are adjacent to the metropolitan areas. These nearby SLAs were also allocated to the metropolitan group of SLAs.

Since industry structure across regional SLAs is different to metropolitan, for each industry type different number of SLAs is available. For example number of SLAs in regional areas that include Wholesale industry is 630 whereas this number for metropolitan areas is 681.

### ***Industry ranking for regional and metropolitan Australia***

Businesses operating within any industry structure vary depending on their size and location. In order to understand this variation, industries were ranked according to the number of businesses they include. Results of the ranking for both regional and metropolitan areas are reflected in Table 1,

based on three different firm sizes, and also total businesses which aggregates all the three firms sizes in this study (note this study excludes large businesses from the complete analysis). Only industries ranked within the top five are included in this Table.

**Table 1**  
**Industry ranking based on the size of business for regional and metropolitan areas**

<b>Regional</b>		<b>Metropolitan</b>	
<b>Businesses who employ:</b>	Total number of businesses within the size/industry	<b>Businesses who employ:</b>	Total number of businesses within the size/industry
<b>Micro (1-4 employee)</b>		<b>Micro (1-4 employee)</b>	
1. Agriculture	35280	1. Property	101373
2. Construction	26190	2. Construction	66387
3. Retail	21423	3. Retail	49956
4. Property	20763	4. Finance	23625
5. Transport	8364	5. Health	23613
<b>Small (5-19 employee)</b>		<b>Small (5-19 employee)</b>	
1. Agriculture	20316	1. Property	30693
2. Retail	14775	2. Retail	29352
3. Property	9591	3. Construction	16590
4. Construction	8121	4. Manufacturing	14328
5. Accommodation	6273	5. Wholesale	11205
<b>Medium (20-199 employee)</b>		<b>Medium (20-199 employee)</b>	
1. Agriculture	4659	1. Property	10257
2. Retail	4203	2. Retail	9279
3. Property	3279	3. Manufacturing	7596
4. Accommodation	3186	4. Accommodation	6210
5. Manufacturing	2226	5. Wholesale	4599
<b>Total (1-199 employee)</b>		<b>Total (1-199 employee)</b>	
1. Agriculture	60459	1. Property	143286
2. Retail	40623	2. Retail	89085
3. Construction	36336	3. Construction	87678
4. Property	34059	4. Manufacturing	44604
5. Accommodation	15435	5. Wholesale	37869

As is evident from Table 1, when the size of business is ignored (Total) "Retail" gets the second rank for both regional and metropolitan areas. "Agriculture" is on the top for regional and property is on the top for metropolitan. The table also indicates that businesses operating within manufacturing industry are less present in regional areas (only for small

business) than what it is for metropolitan areas (small, medium, total). Businesses operating within “Construction” industry appear to be present in a broader range (micro, small, total) for both regional and metropolitan areas. Businesses operating within “Retail” and “Property” industries appear within any size for both regional and metropolitan areas. Businesses operating within “Agriculture, Forestry, and Fishing” industry appear within any size for regional areas.

In addition to the industry ranking “GDP contribution” of industries in Australia was examined for further information (Table 2). The table below only includes those “relevant” industries that are listed in Table 1.

**Table 2**  
**GDP Contribution of Industries in Australia (2006)**

<b>Industry</b>	<b>GDP contribution \$millions</b>	<b>Rank within 19 industries</b>
Manufacturing	25792	2
Construction	18596	3
Retail	12034	10
Property	8860	12
Agriculture	7284	14

Source (ABS, 2010)

A comparison between Table 1 and Table 2 indicates how industry ranking based on the size of business and location (Table 1) relates to contribution of those industries in GDP (Table 2).

As is evident in Table 2, “Manufacturing” has the highest monetary contribution to GDP but as shown in Table 1 its frequency as an industry type in regional Australia is not strong (and is only evident in medium regional businesses) compared with metropolitan Australia. “Construction” industry

shows the 3rd highest rank in Table 2 and presence of businesses within this industry is evenly distributed in terms of size (micro, small, total) for both regional and metropolitan areas. Businesses of all size are present equally within “Retail” and “Property” industries ranked as the 10th and the 12th highest in Table 2 for both regional and metropolitan areas. Not surprisingly businesses of all size are present within “Agriculture, Forestry, and Fishing” industry (ranked 14th in Table 2) for regional areas. This indicates the presence of the various industry types in both regional and metropolitan areas as well as their contribution in GDP.

### ***k-means Clustering and Multiple Regression Analysis***

In the first stage of analysis, k-means clustering algorithm is used to cluster SLAs. Since industries used for analysis (18 types) encompassed all sizes of businesses then cluster analysis generated a consistent number of clusters (7 clusters). These clusters and industries with the highest mean score within each cluster are presented in Tables 3 and 4 for regional and metropolitan areas separately.

The second stage of the research seeks to examine the impact of clusters as independent dummy variables on economic growth (reflected as weekly family income). The hypothesis is that these variables might have different impact on economic growth in regional areas as opposed to metropolitan areas. Clusters are generated and are used as nominal-level dummy variables. Definitions of these dummies are presented in Tables 3 and 4. These dummy variables are as the following:

Micro business (1-4 employee): 7 clusters (MicC1-MicC7)  
 Small business (5-19 employee): 7 clusters (SmallC1-SmallC7)  
 Medium business (20-199 employee): 7 clusters (MedC1-MedC7)  
 Total (1-199 employee): 7 clusters (TotalC1-TotalC7)

**Note: 'C' refers to 'Cluster'.**

The first stage of analysis that included 28 clusters (as independent variables) in a single regression model did not yield any results. It was then decided to define a separate model for each size and examine the models and clusters that are better predictors of economic growth. Regression models are as the follow. These models are identical for both regional and metropolitan data. In order to avoid duplication, only one set of models is presented here:

**Regression models:**

(1) Economic growth=  $a + b_1 \text{MicC1} + b_2 \text{MicC2} + b_3 \text{MicC4} + b_4 \text{MicC5} + b_5$   
 $\text{MicC6} + b_6 \text{MicC7}$

(2) Economic growth=  $a + b_1 \text{SmallC1} + b_2 \text{SmallC2} + b_3 \text{SmallC3} + b_4 \text{SmallC4} + b_5$   
 $\text{SmallC6} + b_6 \text{SmallC7}$

(3) Economic growth=  $a + b_1 \text{MedC1} + b_2 \text{MedC3} + b_3 \text{MedC4} + b_4 \text{MedC5} + b_5$   
 $\text{MedC6} + b_6 \text{MedC7}$

(4) Economic growth=  $a + b_1 \text{TotalC1} + b_2 \text{TotalC2} + b_3 \text{TotalC3} + b_4 \text{TotalC5} + b_5$   
 $\text{TotalC6} + b_6 \text{TotalC7}$

Standard ordinary least-square (OLS) regression method is used for this analysis. For dependent and independent valuables univariate normality were

addressed where necessary. Results for multiple regression analysis are reflected in Tables 5 and 6.

### ***Cluster analysis results***

Cluster analysis revealed clusters of industries associated with each size of business and are presented in Tables 3 and 4. Some industries appear to be dominant in more than one cluster. Highest mean score for each cluster are also reported.

Table 3 represents clusters relating to each size and industry for regional areas only. Highest mean scores are also reported. As shown in the table regardless of the size only three industries fall into one of the existing clusters indicating the highest mean score for those industries. As expected, “Agriculture, Forestry and Fishing” industry happens to be the most frequent industry regardless of the size of business identified. In the first part of the table clusters for micro business are also presented. As shown and compared to other clusters the highest mean belongs to the “Construction” industry, however “Agriculture, Forestry and Fishing” appears to have the highest mean score within four clusters (MicC2, MicC3, MicC5, MicC6). For small business the highest mean score belongs to “Retail”, and “Property” gets the highest mean score for medium business as well as for total. Similar to the micro business, “Agriculture, Forestry and Fishing” happens to be the most recurring industry for all sizes.

Table 4 represents clusters relating to each size for metropolitan areas only. Highest mean scores are also reported. As shown regardless of the size

only three industries fall into one of the existing clusters indicating the highest mean score for those industries. For all business sizes “Property” industry happens to be the dominant industry. As shown “Property” appears to have the highest mean score.

**Table 3**  
**Clustering analysis results (Regional) (ABS, 2007)**

<b>Size</b>	<b>Industry</b>	<b>Highest Mean Score (percent)/Cluster</b>
<b>Micro (1-4 employee)</b>		
MicC1	Construction	213
MicC2	Agriculture, Forestry and Fishing	61
MicC3	Agriculture, Forestry and Fishing	39
MicC4	Transport	96
MicC5	Agriculture, Forestry and Fishing	64
MicC6	Agriculture, Forestry and Fishing	59
MicC7	Property	102
<b>Small (5-19 employee)</b>		
SmallC1	Agriculture, Forestry and Fishing	30
SmallC2	Property	59
SmallC3	Agriculture, Forestry and Fishing	31
SmallC4	Agriculture, Forestry and Fishing	32
SmallC5	Agriculture, Forestry and Fishing	25
SmallC6	Agriculture, Forestry and Fishing	26
SmallC7	Retail	119
<b>Medium (20-199 employee)</b>		
MedC1	Agriculture, Forestry and Fishing	6
MedC2	Retail	6
MedC3	Agriculture, Forestry and Fishing	11
MedC4	Accommodation	4
MedC5	Retail	24
MedC6	Agriculture, Forestry and Fishing	6
MedC7	Property	31
<b>Total (1-199 employee)</b>		
TotalC1	Agriculture, Forestry and Fishing	77
TotalC2	Retail	253
TotalC3	Agriculture, Forestry and Fishing	118
TotalC4	Agriculture, Forestry and Fishing	43
TotalC5	Agriculture, Forestry and Fishing	70
TotalC6	Agriculture, Forestry and Fishing	169
TotalC7	Property	192

**Table 4**  
**Clustering analysis results (Metropolitan) (ABS, 2007)**

<b>Size</b>	<b>Industry</b>	<b>Highest Mean Score (percent)/Cluster</b>
<b>Micro (1-4 employee)</b>		
MicC1	Property	210
MicC2	Property	87
MicC3	Property	563
MicC4	Construction	73
MicC5	Property	862
MicC6	Property	415
MicC7	Property	44
<b>Small (5-19 employee)</b>		
SmallC1	Retail	123
SmallC2	Retail	148
SmallC3	Property	79
SmallC4	Health	165
SmallC5	Property	212
SmallC6	Accommodation	129
SmallC7	Retail	18
<b>Medium (20-199 employee)</b>		
MedC1	Accommodation	17
MedC2	Property	37
MedC3	Retail	23
MedC4	Manufacturing	44
MedC5	Retail	6
MedC6	Property	68
MedC7	Property	62
<b>Total (1-199 employee)</b>		
TotalC1	Retail	127
TotalC2	Retail	512
TotalC3	Property	847
TotalC4	Property	304
TotalC5	Property	60
TotalC6	Property	1154
TotalC7	Construction	436



## ***Multiple regression analysis results***

### ***Regional areas***

The results from the regression analysis for regional and metropolitan areas are presented separately in Tables 5 and 6. Overall, Table 5 indicates that within the small (SmallC7), medium (MedC5), and total (TotalC2) “Retail” clusters obtain the highest coefficients (*Coefficient*=1.59, 0.93, 1.14) as well as the highest *t-values* (*t-values*=10.08, 3.96, 8.76) respectively. This finding is interesting and indicates undeniable role of businesses within “Retail” industry in regional Australia. The presence of businesses of all size (MicC2, SmallC4, MedC3, TotalC1) within “Agriculture, Forestry and Fishing” industry with the second highest coefficient value is considerable but not surprising either. For micro business considering coefficient values for all clusters suggest that the highest coefficient belongs to cluster MicC1 “Construction” and the second highest coefficient belongs to “Agriculture, Forestry and Fishing” industry. MicC7 “Property” obtains the lowest *coefficient value*= 0.36 and *t-value* = 2.39.

### ***Metropolitan areas***

Table 6 presents the role and presence of businesses of different size within “Property” industry. “Property” industry obtains the highest coefficient for all sizes with MicC3, SmallC5, MedC6 obtains the highest coefficients (*Coefficient*=2.69, 2.10, 1.94) and *t-values* (*t-values*= 19.39, 15.91, 11.33) respectively. These findings show the role of businesses within “Property” industry for metropolitan Australia. From the analysis, the change is evident as we move to the second highest coefficients within each size. Considering

coefficients in Table 6 suggest that the second highest coefficient belongs to cluster MicC4 “Construction”, SmallC2 “Retail” and MedC4 “Manufacturing”.

Partial *F*-test analysis was also conducted to determine whether the models are significantly different and which model performs better. However, due to the value of degree of freedom being the same for all the models it did not yield any results. Highest  $R^2$  value for both regional (0.18) and metropolitan (0.60) analysis belongs to the first model Micro (1-4 employee).

**Table 5**  
**Regression analysis results (Regional)**

<i>Independent Variable</i>	<i>Coefficient</i>	<i>SE coefficient</i>	<i>Standardised coefficient</i>	<i>T-statistics</i>	<i>P-value</i>
<b>Micro (1-4employee)</b>					
Intercept	-0.21	0.05		-4.7	0.001
MicC1	1.73	0.15	0.42	11.74	0.001
MicC2	0.45	0.16	0.10	2.84	0.005
MicC7	0.36	0.15	0.08	2.39	0.017
<b><math>R^2=0.18</math>; adjusted <math>R^2=0.17</math>; SEE=0.90</b>					
<b>Small (5-19 employee)</b>					
Intercept	-0.17	0.05		-3.53	0.001
SmallC7	1.59	0.16	0.37	10.08	0.001
SmallC2	0.46	0.21	0.08	2.22	0.027
SmallC4	0.40	0.19	0.07	2.13	0.033
<b><math>R^2=0.14</math>; adjusted <math>R^2=0.13</math>; SEE=0.92</b>					
<b>Medium (20-199 employee)</b>					
Intercept	-0.17	0.20		-0.93	0.351
MedC5	0.93	0.23	0.28	3.96	0.001
MedC3	0.55	0.26	0.12	2.10	0.036
<b><math>R^2=0.07</math>; adjusted <math>R^2=0.06</math>; SEE=0.96</b>					
<b>TOTAL (1-199 employee)</b>					
Intercept	-0.20	0.04		-4.23	0.001
TotalC2	1.14	0.13	0.33	8.76	0.001
TotalC1	0.55	0.18	0.11	3.00	0.003
TotalC7	0.30	0.16	0.07	1.93	0.054
<b><math>R^2=0.11</math>; adjusted <math>R^2=0.10</math>; SEE=0.87</b>					

**Table 6**  
**Regression analysis results (Metropolitan)**

<i>Independent Variable</i>	<i>Coefficient</i>	<i>SE coefficient</i>	<i>Standardised coefficient</i>	<i>T-statistics</i>	<i>P-value</i>
<b>Micro (1-4 employee)</b>					
Intercept	-0.502	0.03		-16.38	0.001
MicC3	2.69	0.14	0.48	19.39	0.001
MicC4	0.57	0.10	0.14	5.70	0.001
<b><math>R^2=0.60</math>; adjusted <math>R^2=0.59</math>; SEE=0.63</b>					
<b>Small (5-19 employee)</b>					
Intercept	-0.44	0.03		-14.05	0.001
SmallC5	2.10	0.13	0.42	15.91	0.001
SmallC2	1.95	0.13	0.41	15.27	0.001
<b><math>R^2=0.53</math>; adjusted <math>R^2=0.53</math>; SEE=0.68</b>					
<b>Medium (20-199 employee)</b>					
Intercept	-0.42	0.03		-12.39	0.001
MedC6	1.94	0.17	0.32	11.33	0.001
MedC4	1.80	0.09	0.53	18.47	0.001
MedC1	0.81	0.10	0.22	7.65	0.001
MedC3	0.73	0.13	0.16	5.61	0.001
<b><math>R^2=0.46</math>; adjusted <math>R^2=0.46</math>; SEE=0.73</b>					
<b>TOTAL (1-199 employee)</b>					
Intercept	-0.47	0.03		-15.44	0.001
TotalC2	2.36	0.16	0.40	14.98	0.001
TotalC6	2.05	0.19	0.28	10.73	0.001
TotalC7	1.81	0.12	0.41	15.76	0.001
<b><math>R^2=0.55</math>; adjusted <math>R^2=0.55</math>; SEE=0.65</b>					

**Notes: Coefficients in bold: Significant at the 95 percent level**

### ***Analysis and discussion***

The purpose of this paper was to investigate the impact of industry structure and the businesses operating within these industries on economic growth. This was considered on the basis of size of business and the location. Findings of this paper show that Australian businesses are impacted differently by the changing industry structure in regional and metropolitan areas. Different industry structures might have different impact on economic growth. This is identified by Beer et al. (2003) and reflected in O'Connor et al. (2001) as they suggest that the reason for businesses operating differently in New South Wales and Victoria could be concentration of particular industry types in those areas.

The analysis in this paper suggests that the impact of businesses varies depending on their size and the industry within which they operate. Analysis also shows that for regional Australia small and medium size businesses operating in “Retail” industry have the highest positive impact on economic growth. Micro businesses within “Agriculture, Forestry, and Fishing” industry show the second highest positive impact and the highest belongs to businesses in the “Construction” industry. Regardless of the size of business, “Retail” industry still shows the highest positive impact in the “Total” category. Micro and medium businesses operating in “Agriculture, Forestry, and Fishing” industry show the second highest positive impact on economic growth. This is the case for businesses in “Agriculture, Forestry, and Fishing” regardless of the size as well. Businesses in small category operating in “Agriculture, Forestry, and Fishing” industry have the third highest positive impact. Although primary industries such as “Agriculture, Forestry, and Fishing” employ less people, they have kept their significance due to significant technological advances. Porter (1998) suggests that innovation through technological advances has made agriculture extremely productive without hardly any labour required. He also suggests (Porter 2003) that in advanced economies, primary industries dependent on natural endowments (for example mining and energy) are more efficient and employ less.

For metropolitan Australia the impact is different. Businesses of micro, small, and medium size operating in “Property” industry indicate the first highest positive impact on economic growth. These findings show the role of different size businesses operating within “Property” industry. The second highest impact belongs to the businesses operating in “Retail” industry. For

small businesses this impact is the second, and the fourth for medium businesses. Regardless of the size of the business, “Retail” shows the highest positive impact in “total” category.

All these findings indicate the impact of size of businesses operating within “Retail” and “Agriculture, Forestry, and Fishing” industries on economic growth for regional Australia. On the other hand businesses with different size operating within “Property” and “Retail” industries show significant impact on economic growth for metropolitan Australia.

## ***Conclusion***

Australian industry has gone through a big shift within last few decades. Understanding the role of industry structure, size of business and location on economic growth is important. Grouping businesses operating within different industries based on their size could help to better understand this role. Major cities generally have a very diverse industry structure, and a region's industry structure is closely tied to its level of remoteness.

This paper addresses the gap in literature in terms of quantitative research to identify the role of industry structure, size of business and location on economic growth. This impact was considered for both regional and metropolitan Australia separately. This study clustered SLAs in both regional and metropolitan Australia using *k*-means clustering algorithm and investigated the role of emerging clusters on economic growth. Overall this research assists in identifying some key factors in terms of industry structure

and size of business that contribute to the economic growth in regional and metropolitan areas.

Findings of this paper suggest that the role of these factors as drivers of economic growth are positive however different for regional and metropolitan Australia. Findings show that in regional areas “Retail” and “Agriculture, Forestry, and Fishing” industries were found to be the main drivers of economic growth whereas the main drivers of economic growth for metropolitan areas were found to be “Property” and “Retail” industries.

Our findings could have some policy implications for future economic planning and focus on SMEs for regional and metropolitan Australia. This could highlight the need for reviewing funding and support policies for SMEs across different industries in regional and metropolitan areas separately. These findings might indicate that “Retail” and “Property” industries should be considered in regional areas as much as they are for metropolitan areas. “Agriculture, Forestry, and Fishing” industry must get highest focus in regional areas and “Property” industry must get the highest focus in metropolitan Australia.

Given the booming mining and energy industries, further research would benefit from investigating the effects of businesses of different sizes within these industries and across mining and energy towns and locations on economic growth. Closer inspection of this would be valuable with new census data being collected for Australia this year. It is anticipated therefore

that greater insight into rural and regional Australia and industry will be provided.

## References

- Acs, Z. J. (1992). Small Business Economics: A Global Perspective. *Challenge*, 35 (6), 38-44.
- Agarwal, R., & Audretsch, D.B. (2001). Does Entry Size Matter? The Impact of The Life Cycle and Technology on Firm Survival. *The Journal of Industrial Economics*, 49(1), 21-43.
- Armington, C., & ACS, Z.J. (2002). The determinants of regional variation in New Firm Formation. *Regional Studies*, 36(1), 33-45.
- Artobolevskiy, S.S., Gorkin, A.P., & Smirnyagin, L.V. (1984). The Role of Industry in Regional Development in Capitalist Countries. *Geoforum*, 15(1), 49-55.
- Australian Bureau of Statistics. (2007). *Counts of Australian Businesses, including Entries and Exits, Jun 2003 to Jun 2007, Cat. No. 8165.0. Canberra: ABS*
- Australian Bureau of Statistics. (2010). *Australian National Income, Expenditure and Product, Cat. No. 5206.0. Canberra: ABS*
- Bagirov, A.M., & Mardaneh, K. (2006). Modified Global K-Means Algorithm for Clustering in Gene Expression Data Sets. *In Proc. 2006 Workshop on Intelligent Systems for Bioinformatics (WISB 2006)*, Hobart, Australia. CRPIT, 73. Boden, M. and Bailey, T. L., Eds. ACS. 23-28.
- Beer, A., & Clower, T. (2009). Specialisation and Growth: Evidence from Australia's Regional Cities. *Urban Studies*, 46, 369-388.

- Beer, A., & Maude, A. (1995). Regional Cities in The Australian Urban system, 1961-1991. *Urban Policy and Research*, 13(3), 135-148.
- Beer, A., Maude, A., & Pritchard, B. (2003). *Developing Australia's Regions: theory and practice*. Sydney: University of New South Wales Press.
- Beugelsdijk, S. (2007). Entrepreneurial culture, regional innovativeness and economic growth. *Journal of Evolutionary Economics*, 17(2), 187-210.
- Blakely, E.J. (2004). Regional Science Cyclops- From a One Eye to Two Eyed View of a Changing Regional Science World. *Australasian Journal of Regional Studies*, 10(3), 265-277.
- Carree, M. A., & Thurik, A. R. (1999). Industrial Structure and Economic Growth, in D. B. Audretsch and A. R. Thurik (eds.), *Innovation, Industry Evolution, and Employment*, Cambridge University Press, Cambridge.
- Commonwealth Department of Transport and Regional Services. (2001). *The Success Factors-managing change in regional and rural Australia*. 1-19.
- Cornett, A. P. (2009). Aims and strategies in regional innovation and growth policy: A Danish perspective. *Entrepreneurship & Regional Development*, 21(4), 399 - 420.
- Curran, J., & Storey, D. J. (2002). Small business policy in the United Kingdom: the inheritance of the Small Business Service and implications for its future effectiveness. *Environment and planning C: Government and Policy*, 20(2), 163-177.
- Dean, T.J., Brown, R.L. (1998). Differences in Large and Small Firm Responses to Environmental Context: Strategic Implications from a Comparative Analysis of Business Formations. *Strategic Management Journal*, 19(8), 709-728.



Delgado, M., Porter, M.E., & Stern, S. (2010). Clusters and entrepreneurship. *Journal of Economic Geography*, 10(4), 495-518.

Department of Infrastructure, Transport, Regional Development and Local Government, Bureau of Infrastructure, Transport and Regional Economics. (2009). *Information Sheet 32: Changes in Australia's industry structure: main cities 2001-2006*, 1-20.

Department of Infrastructure, Transport, Regional Development and Local Government, Bureau of Infrastructure, Transport and Regional Economics. (2008). *About Australia's Regions*. 18-19.

Department of Innovation, Industry, Science and Research. (2009). What's in the 2009-10 Budget for Small Business?,. Retrieved November 24, 2010 from:

<http://www.opinnov.org/General/Corporate/Pages/Whatsinthe2009-10BudgetforSmallBusiness.html>

Department of Transport and Regional Services, Bureau of Transport and Regional Economics. (2003). *Information Paper 49: Focus on Regions: No.1: Industry structure*.1-67.

Dejardin, M., & Fritsch, M. (2010). Entrepreneurial dynamics and regional growth. *Small Business Economics*, 36(4), 377-382.

Dobbs, M., & Hamilton, R. T.(2007). Small business growth: recent evidence and new directions. *International Journal of Entrepreneurial Behaviour & Research*, 13(5), 296-322.

Enright, M.J., & Roberts, B.H. (2001). Regional Clustering in Australia. *Australian Journal of Management*, 26, 65-85.

- Feser, E., Renski, H., & Goldstein, H. (2008). Clusters and Economic Development Outcomes An Analysis of the Link Between Clustering and Industry Growth. *Economic Development Quarterly*, 22(4), 324-344.
- Freestone, R., Murphy, P., & Jenner, A. (2003). The functions of Australian towns, revisited. *Tijdschrift voor Economische en Sociale Geografie*, 94(2), 188-204.
- Gray, C. (2002). Entrepreneurship, resistance to change and growth in small firms. *Journal of Small Business and Enterprise Development*, 9(1), 61-72.
- Hudson. M., Smart. A., & Bourne, M. (2001). Theory and practice in SME performance measurement systems. *International Journal of Operations & Production Management*, 21(8), 1096-1115.
- Keeble, D. (1997). Small Firms, Innovation and Regional Development in Britain in the 1990s. *Regional Studies*, 31(3), 281-293.
- Koster, S. (2007). The entrepreneurial and replication function of new firm formation. *Tijdschrift voor Economische en Sociale Geografie*, 98(5), 667-674.
- Lowe, J., & Henson, S. (2005). Small towns and regional firms- toward a typology. 2nd Future of Australia's Country Towns Conference, Bendigo, 11-13 July, 2005.
- Mueller, P., Stel A.V., & Storey D.J. (2008). The effects of new firm formation on regional development over time: The case of Great Britain, *Small Bus Econ*, 30(1), 59-71.

- Murphy, P., & Watson, S. (1994). Social Polarization and Australian Cities. *International Journal of Urban and Regional Research*, 18(4), 573-590.
- O'Connor, K., Stimson, R., & Daly, M. (Eds.). (2001). *Australia's Changing Economic Geography: A society Dividing*. Melbourne, Oxford University Press.
- OECD. (2009), How Regions Grow. Retrieved January 28, 2011 from: <http://www.oecd.org/dataoecd/18/45/42446805.pdf>.
- Okamuro, H., & Hobayashi, N. (2006). The Impact of Regional Factors on the Start-up Ratio in Japan. *Journal of Small Business Management*, 44(2), 310-313.
- Pagano, P. (2003). Firm Size Distribution and Growth. *Scandinavian Journal of Economics*, 105(2), 255-274.
- Pagano, P., & Schivardi, F. (2000). Firm Size Distribution and Growth, mimeo. Retrieved December 10, 2010 from: <http://digilander.libero.it/fshivardi>.
- Paraskevopoulos, C.C. (1974). Patterns of Regional Economic Growth. *Regional and Urban Economics*, 4(1), 77-105.
- Porter, M.E. (1998). Clusters and the New Economics of Competition. *Harvard Business Review*, 76(6), 77-90.
- Porter M.E. (2000). Location, competition, and economic development: local clusters in a global economy. *Economic Development Quarterly*, 14(1), 15-20.
- Porter, M.E. (2003). The Economic Performance of Regions. *Regional Studies*, 37(6-7), 549-578.

- Sierdjan, K. (2007). The Entrepreneurial and Replication Function of New Firm Formation. *Urban and regional studies. Tijdschrift voor Economische en Sociale Geografie*, 98(5), 667-674.
- Smallbone, D., Leig, R., & North, D. (1995). The characteristics and strategies of high growth SMEs. *International Journal of Entrepreneurial Behaviour & Research*, 1(3), 44-62.
- Walker, E., & Brown, A. (2004). What Success Factors are Important to Small Business Owners? *International Small Business Journal*, 22(6) 577-594.
- Wijewardena, H., & Tibbits, G.E. (1999). Factors Contributing to the Growth of Small Manufacturing Firms: Data from Australia. *Journal of Small Business Management*, 37, 88-95.