Markups and concentration in South African manufacturing sectors

An analysis with administrative data

Johannes Fedderke,¹ Nonso Obikili,² and Nicola Viegi³

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Abstract: This paper uses newly available firm-level tax data to evaluate the market structure in South African manufacturing sectors in the period 2010–12. To describe the market structure we compute markups for South African manufacturing firms and concentration indexes for 4-digit manufacturing sectors. We find both significant markups and significant concentration across most sectors. We compare computed markups and concentration with early estimates in South Africa and with other international benchmark countries. We then examine the market structure based on the concentration, firms’ size, and entry and exit dynamics to rule out some potential explanations for relatively high markups. We find that the relationships are not monotonic and point to the importance of specific barriers to entry in explaining the relationship between these three characteristics.

Keywords: firm microdata, markup pricing, concentration, manufacturing, South Africa
JEL classification: L11, L13, L60
1 Introduction

In a model of creative destruction, a la Aghion and Howitt (1992), economic growth is directly linked to productivity improvements generated by the entry of firms looking to exploit the profits opportunities of new technologies and by the competitive response of incumbent firms (Luttmer, 2007). It follows that the analysis of market structure, competitive pressures, and entry-exit dynamics of firms are fundamental blocks in the analysis of a country’s growth process.

This is urgent in the case of South Africa, a country in need of a significant acceleration of its growth trajectory. Until now analysis of market structure in South Africa has been mainly based on aggregate or sectoral data. This has given a static picture of a low competitive environment with significant monopoly rents represented by high markups over marginal cost (Aghion et al. 2008) and large market concentration (Fedderke and Naumann, 2011). These results have been discussed by a subsequent literature that tested the results using different datasets (Du Plessis et al., 2015) or different methodologies and theoretical frameworks (Zalk, 2014). Nevertheless, high markups and high concentration rates represent our baseline understanding of the South African market structure and they underpin the majority of current academic and policy debates (World Bank, 2016).

A limitation of the existing literature is that the quasi total absence of firm-level data has significantly constrained the ability of researchers to fully understand the process of firms creation and destruction and its link to market structure, productivity and economic growth in South Africa.

In this paper we make use of newly available tax administrative data at the firm-level collected by the South African Revenue Service (SARS). A significant advantage of this database is that, given the negligible size of the South African informal sector, the tax administration data represents a very high degree of coverage of South African firms. The newly acquired access to tax administrative data therefore gives us a opportunity to start answering some of these questions using a large population of firms for which we know all
the information collected by the tax administration.

The contribution of this paper is threefold:

• We calculate and analyse the level of markups in the South African manufacturing sectors for the period 2010-2012 using balance sheet data from administrative tax data of around 60,000 South African firms. The results are compared to previous estimates from aggregate and industry level and with comparable international research.

• We use the same data to calculate the concentration levels in 4-digit manufacturing sectors in South Africa.

• We explore the dynamics of entry and exit of firms and market structure and infer some potential explanations for the relatively high markups and concentration, particularly the influence of barriers to entry. We show the importance of micro analysis in the design of policy intervention for industrial development.

The paper is organized as follows. In the next section we describe the data pointing out the possibilities and the limitations that attach to these data for the purpose of analysing firm behaviour. In Section 3 we review the mark-up debate in South Africa and provide new calculations of markups using tax administration data. In Section 4 we conduct the same exercise in the analysis of market concentration. These two sections confirm the view of generally high markups and low competitive pressure, but also show a considerable degree of heterogeneity characterising firm behaviour in South Africa. In Section 5 we link markups and concentration to the exit and entry dynamics of firms. We show that markups are not correlated with industry concentration, but are significantly linked to proxies of barriers to entry, either natural or institutional. Section 6 concludes and indicates the avenue of research that the availability of tax administrative data opens to understand firm behaviour and the dynamics of growth in South Africa.
2 Data

The primary data for the calculations in this paper are obtained from information collected by the South African Revenue Service (SARS) to calculate the annual corporate income tax liability of firms. These data have been made available thanks to a joint project by UNU-WIDER and the National Treasury of South Africa. The dataset includes information on about 900,000 unique firms with new firms entering the data set at different times and some firms leaving the dataset or going dormant. While the dataset includes all firms registered for corporate income tax purposes, in this paper we focus only on firms involved in manufacturing activities. Although the dataset includes information from 2009 to 2013, we only use data for the period 2010 to 2011 for two reasons. First the total number of firms in the dataset jumps between 2009 and 2010, showing a dramatic increase. This suggests that the data provided for 2009 might be incomplete, especially since by 2010 South Africa had not fully emerged from the impact of the 2008 global financial crisis. In 2009 there were about 172,000 active firms in the data set, i.e. firms who submitted some tax information and reported as not dormant. The number of active firms jumps to 658,000 in 2010, 623,000 in 2011 and 525,000 in 2012. This suggests that the data for 2009 is incomplete. We therefore exclude 2009 from our analysis.

Secondly the number of firms in 2013 falls dramatically when compared to the number of firms in 2012. The total number of active firms in the data in 2013 falls to about 385,000. This is a drop of over 25 percent and suggests that the data might again be incomplete, perhaps because tax filings might not have been completed at the time of data capture. We therefore restrict our analysis to the 2010-2012 period.

Table 1 shows the number of firms with suitable data for each year of observation and for each manufacturing sector in the dataset.

We classify firms into the standard 3-digit manufacturing sectors as used in Fedderke and Hill (2011). This results in 29 manufacturing sectors reported. While the number of employees is typically used to classify firms for size purposes, unfortunately balance sheet
data does not include information about the total number of employees in the firms. We therefore use the size of the total reported assets of the firms as an alternative classification for size. The average number of firms in each industrial and size category for the years 2010 through 2012 are reported in Table 2.
|                           | 2009 | 2010 | 2011 | 2012 | 2013 |
|---------------------------|------|------|------|------|------|
| Food and Food Products    | 622  | 2144 | 2084 | 2221 | 2145 |
| Beverages                 | 246  | 831  | 858  | 996  | 1163 |
| Tobacco                   | 16   | 68   | 78   | 87   | 79   |
| Textiles                  | 448  | 1640 | 1603 | 1593 | 1512 |
| Clothing, except Footwear| 358  | 1223 | 1258 | 1505 | 1717 |
| Leather and Products from Leather | 119  | 372  | 356  | 370  | 323  |
| Footwear                  | 76   | 322  | 329  | 380  | 363  |
| Wood and Wood and Cork Products | 186  | 666  | 620  | 630  | 684  |
| Furniture                 | 386  | 1351 | 1292 | 1267 | 1245 |
| Paper and Paper Products  | 260  | 962  | 961  | 958  | 895  |
| Printing, Publishing and Allied Industries | 495  | 1977 | 1880 | 1774 | 1645 |
| Coal and Refined Petroleum | 123  | 507  | 524  | 525  | 546  |
| Basic Chemicals           | 278  | 1118 | 1093 | 1004 | 863  |
| Other Chemicals           | 322  | 1222 | 1183 | 1009 | 817  |
| Rubber Products           | 107  | 419  | 382  | 353  | 323  |
| Plastic Products          | 289  | 1087 | 1044 | 976  | 972  |
| Glass and Glass Products  | 195  | 673  | 599  | 576  | 520  |
| Other Non-metals          | 392  | 1208 | 1212 | 1368 | 1209 |
| Basic Iron and Steel Industries | 345  | 1277 | 1183 | 1187 | 1234 |
| Non-ferrous Metal Basic Industries | 109  | 389  | 380  | 348  | 299  |
| Metal Products, except Machinery and Equipment | 1112 | 4429 | 4140 | 3603 | 2821 |
| Machinery, except Electrical | 752  | 3150 | 3100 | 2691 | 2104 |
| Electrical Machinery Apparatus | 1321 | 5084 | 4821 | 4188 | 3183 |
| Television, Radio and Communication Equipment | 460  | 2263 | 2108 | 1606 | 813  |
| Professional and Scientific Equipment | 204  | 800  | 838  | 788  | 655  |
| Motor Vehicles, Parts and Accessories | 1686 | 5887 | 5639 | 5589 | 5621 |
| Transport Equipment       | 189  | 686  | 663  | 651  | 517  |
| Other Manufacturing Industries | 584  | 2183 | 2101 | 2053 | 1802 |

Authors’ calculations.
3 Digit Sectors used as in Fedderke and Hill(2011).
| Industry                                | All  | No Assets | 0 - R1m | R1m - R10m | R10m - R100m | R100m+ |
|-----------------------------------------|------|-----------|---------|------------|--------------|--------|
| Food and Food Products                  | 2150 | 882       | 835     | 284        | 117          | 32     |
| Beverages                               | 895  | 302       | 355     | 123        | 77           | 38     |
| Tobacco                                 | 78   | 29        | 25      | 10         | 9            | 5      |
| Textiles                                | 1612 | 640       | 613     | 235        | 102          | 22     |
| Clothing, except Footwear               | 1329 | 420       | 749     | 115        | 41           | 4      |
| Leather and Products from Leather       | 366  | 148       | 147     | 51         | 15           | 5      |
| Footwear                                | 344  | 126       | 135     | 59         | 20           | 4      |
| Wood and Wood and Cork Products         | 639  | 278       | 202     | 124        | 29           | 6      |
| Furniture                               | 1303 | 548       | 528     | 189        | 36           | 2      |
| Paper and Paper Products                | 960  | 410       | 329     | 144        | 52           | 26     |
| Printing, Publishing and Allied Industries | 1877 | 832       | 750     | 224        | 56           | 15     |
| Coal and Refined Petroleum              | 519  | 220       | 117     | 130        | 39           | 13     |
| Basic Chemicals                         | 1071 | 483       | 287     | 194        | 73           | 34     |
| Other Chemicals                         | 1138 | 514       | 354     | 174        | 66           | 31     |
| Rubber Products                         | 385  | 183       | 81      | 88         | 27           | 6      |
| Plastic Products                        | 1036 | 485       | 199     | 219        | 108          | 25     |
| Glass and Glass Products                | 616  | 271       | 204     | 108        | 30           | 3      |
| Other Non-metals                        | 1263 | 491       | 497     | 191        | 69           | 15     |
| Basic Iron and Steel Industries         | 1216 | 519       | 339     | 219        | 110          | 29     |
| Non-ferrous Metal Basic Industries      | 372  | 158       | 113     | 65         | 25           | 12     |
| Metal Products, except Machinery and Equipment | 4057 | 2013      | 1030    | 771        | 219          | 24     |
| Machinery, except Electrical            | 2980 | 1376      | 838     | 551        | 178          | 38     |
| Electrical Machinery Apparatus          | 4698 | 2240      | 1364    | 801        | 243          | 50     |
| Television, Radio and Communication Equipment | 1992 | 1034      | 603     | 258        | 80           | 17     |
| Professional and Scientific Equipment   | 809  | 337       | 279     | 131        | 53           | 9      |
| Motor Vehicles, Parts and Accessories   | 5705 | 2539      | 1783    | 1001       | 295          | 87     |
| Transport Equipment                     | 667  | 265       | 303     | 79         | 14           | 6      |
| Other Manufacturing Industries          | 2112 | 888       | 859     | 280        | 76           | 10     |

Authors’ calculations.
3 Digit Sectors used as in Fedderke and Hill (2011).
3 Markups in South African manufacturing industry

The nature of competition in any given industry has many characteristics of which only a few can be easily quantified. One of such characteristics is the pricing behaviour of firms. Specifically, the markups of price over marginal cost serves as an indicator of the relative level of competitiveness of industry via firm pricing power.

The first task in this paper is to provide new measures of markups in South African manufacturing sectors for the period 2010 to 2012. Previous studies focused on South Africa have found markups to be relatively high. Aghion, Braun, and Fedderke (2008) and Fedderke, Kularatne and Mariotti (2007) provide the baseline calculation of markups in South Africa which have been a central point of reference for several following studies. Both studies use aggregate industry data and firm-level data only from publicly listed companies and find consistently that markups in South Africa are significantly higher than corresponding industries in other countries. This result has been questioned by Du Plessis et al. (2015) using only listed companies information, and by Zalk (2014) mainly from a methodological point of view.

All these studies face the limitation of using either aggregate data or data for a very specific sub-set of firms, generally firms listed in the Johannesburg Stock Exchange. Therefore they capture at best only the behaviour of a limited, although important, group of firms.

The availability of comprehensive firm-level data in the present study allows us calculate markups directly from firm balance-sheet data for the full set of firms in South Africa that are subject to filing tax returns. We calculate markups for the period 2010 to 2012 and we aggregate these markups at industry level to compare our results with earlier estimates of markups across industry. Finally, we compare these markups with markups estimated with similar administrative data for Finland (Tamminen 2013).
3.1 Methodology

Markups for each firm are calculated using the methodology developed by Tamminen (2013) which is based on the production function framework in Hall (1988). The markups are derived using the firms profit function and the equation that links price with variable costs. The firm profit is equal to the difference between total revenues and total costs i.e:

\[ \pi_i = TR_i - TC_i = p_i q_i - c_i q_i - FC_i \]  

where \( p_i \) is the unitary price, \( c_i \) indicates variable unitary cost \( c_i \), \( q_i \) is the quantity produced and \( FC_i \) is the fixed cost. The markup for firm \( i \) is defined as:

\[ p_{ij} = (1 + \mu_i) c_i \]  

where \( \mu_i \) represents the markup of firm \( i \) over marginal cost, \( p \) represent the price of the output and \( c \) represents the marginal costs. Equation (2) can be re-written as:

\[ \mu_i = \frac{(p_i - c_i)}{c_i} \]  

Equation (3) can then be transformed by multiplying by total quantity sold

\[ \mu_i = \frac{(p_i - c_i)q_i}{c_i q_i} = \frac{(TR_i - VC_i)}{VC_i} \]  

where \( TR_i \) represents total sales for firm \( i \), and \( VC_i \) represents the variable costs for firm \( i \). The markups for each firm can then be easily calculated from balance sheet data. From equation (4) markups are calculated from total revenue from sales and variable costs. Variable costs include all labour costs and costs of sales from the balance sheets.

One side-effect of this methodology is that calculated markups will depend on the economy-wide conditions in that year. For instance, it has been shown that, due to stickiness in wages, markups would be countercyclical to the business cycle. We therefore expect the
calculated markups vary year on year.

3.2 Results

The average markups for each industrial category are reported in Table 3. The markups appear to be very large.

Table 3: Average markups

|                             | 2010 | 2011 | 2012 |
|-----------------------------|------|------|------|
| Food and Food Products      | 1.64 | 1.36 | 19.83 |
| Beverages                   | 2.25 | 0.82 | 2.28 |
| Tobacco                     | 3.94 | 36.55| 0.75 |
| Textiles                    | 1.59 | 0.71 | 1.33 |
| Clothing, except Footwear   | 1.08 | 0.78 | 0.70 |
| Leather and Products from Leather | 0.72 | 0.57 | 0.52 |
| Footwear                    | 0.74 | 0.45 | 0.49 |
| Wood and Wood and Cork Products | 1.01 | 2.15 | 0.80 |
| Furniture                   | 1.48 | 0.72 | 0.60 |
| Paper and Paper Products    | 0.73 | 3.16 | 0.66 |
| Printing, Publishing and Allied Industries | 1.93 | 1.26 | 5.65 |
| Coal and Refined Petroleum | 0.43 | 0.36 | 0.37 |
| Basic Chemicals             | 31.16| 1.15 | 1.23 |
| Other Chemicals             | 2.58 | 0.80 | 1.08 |
| Rubber Products             | 0.81 | 0.60 | 0.80 |
| Plastic Products            | 0.81 | 0.44 | 5.58 |
| Glass and Glass Products    | 0.88 | 0.64 | 0.88 |
| Other Non-metals            | 1.02 | 3.48 | 1.50 |
| Basic Iron and Steel Industries | 0.93 | 0.53 | 0.72 |
| Non-ferrous Metal Basic Industries | 1.46 | 0.53 | 0.48 |
| Metal Products, except Machinery and Equipment | 1.19 | 2.14 | 1.32 |
| Machinery, except Electrical | 3.87 | 3.21 | 2.24 |
| Electrical Machinery Apparatus | 2.24 | 3.18 | 1.78 |
| Television, Radio and Communication Equipment | 3.49 | 1.39 | 3.97 |
| Professional and Scientific Equipment | 1.73 | 1.02 | 1.26 |
| Motor Vehicles, Parts and Accessories | 0.84 | 1.12 | 0.98 |
| Transport Equipment         | 5.96 | 3.78 | 1.92 |
| Other Manufacturing Industries | 1.14 | 1.27 | 0.98 |

Authors’ calculations.

3 Digit Sectors used as in Fedderke and Hill(2011).

One possible reason for this may be due to the large number of small firms in the dataset.
that do not have significant labour costs. Thus for example, a sole proprietorship with no employees would have no reported labour costs and thus would generate a relatively high markup. To work around this problem we report, in Table 4, markups weighted by the total assets of the firm for each year. Since we expect to observe volatility in the computed markups we also report the three year averages. We note immediately that the magnitude of reported markups under the asset weighting approach of Table 4, immediately generates estimated magnitudes that are considerably more plausible than the unweighted estimates of Table 3. Some sectors show consistently low markups across all years, such as the Rubber products sector, and the Non-ferrous metals sector. Equally, however, a number of sectors show consistently high markups, such as the Coal and refined petroleum sector and the Printing, publishing and allied industries sector. In general, there is a lot variation in average markups across years and sectors.

We also report the unweighted markups for each sector grouped into size based on total assets. In Table 5 we report three-year-average markups for each sector categorized by the size of the firm. Firms are grouped into five different categories; firms with no reported assets, firms with assets between 0 and R1 million, firms with assets between R1 million and R10 million, firms with assets between R10 million and R100 million, and firms with assets above R100 million. Across most sectors, average markups appear to reduce as firm size increases. The exceptions to this pattern are the Beverages sector, Paper and paper products, Coal and refined petroleum, and Basic chemicals sectors.
Table 4: Average markups weighted by total assets

| Category                                      | 2010 | 2011 | 2012 | 3 Year Average |
|-----------------------------------------------|------|------|------|-----------------|
| Food and Food Products                        | 0.37 | 0.25 | 1.54 | 0.72            |
| Beverages                                     | 0.32 | 0.39 | 4.65 | 1.79            |
| Tobacco                                       | 0.27 | 0.24 | 1.22 | 0.58            |
| Textiles                                      | 0.17 | 0.40 | 0.49 | 0.35            |
| Clothing, except Footwear                    | 0.28 | 0.27 | 0.21 | 0.26            |
| Leather and Products from Leather            | 0.12 | 0.26 | 0.22 | 0.20            |
| Footwear                                      | 10.55| 0.41 | 0.28 | 3.75            |
| Wood and Wood and Cork Products              | 0.64 | 0.71 | 0.32 | 0.56            |
| Furniture                                     | 0.36 | 0.33 | 0.30 | 0.33            |
| Paper and Paper Products                     | 1.83 | 0.52 | 0.45 | 0.93            |
| Printing, Publishing and Allied Industries    | 1.04 | 0.58 | 1.08 | 0.90            |
| Coal and Refined Petroleum                   | 0.54 | 0.59 | 0.67 | 0.60            |
| Basic Chemicals                              | 2.37 | 0.24 | 0.31 | 0.97            |
| Other Chemicals                              | 0.33 | 0.32 | 0.32 | 0.32            |
| Rubber Products                              | 0.17 | 0.13 | 0.01 | 0.10            |
| Plastic Products                             | 0.31 | 0.18 | 1.10 | 0.53            |
| Glass and Glass Products                     | 0.41 | 0.78 | 0.48 | 0.56            |
| Other Non-metals                             | 0.09 | 0.51 | 0.38 | 0.33            |
| Basic Iron and Steel Industries              | 0.40 | 0.26 | 0.49 | 0.38            |
| Non-ferrous Metal Basic Industries           | 0.11 | 0.10 | 0.13 | 0.11            |
| Metal Products, except Machinery and Equipment| 0.48 | 1.33 | 0.47 | 0.75            |
| Machinery, except Electrical                 | 0.91 | 0.33 | 0.33 | 0.52            |
| Electrical Machinery Apparatus               | 0.13 | 0.48 | 0.43 | 0.35            |
| Television, Radio and Communication Equipment| 0.26 | 0.22 | 0.45 | 0.31            |
| Professional and Scientific Equipment        | 0.46 | 0.40 | 0.39 | 0.42            |
| Motor Vehicles, Parts and Accessories        | 0.23 | 0.15 | 1.88 | 0.75            |
| Transport Equipment                          | 0.59 | 0.60 | 0.19 | 0.46            |
| Other Manufacturing Industries               | 0.42 | 0.94 | 0.65 | 0.67            |

Authors’ calculations.
3 Digit Sectors used as in Fedderke and Hill(2011).
| Asset Group                                      | No Assets | 0 - R1m | R1m - R10m | R10m - R100m | R100m+ | CR8 |
|-------------------------------------------------|-----------|---------|------------|--------------|--------|-----|
| Food and Food Products                          | 1.10      | 1.48    | 23.90      | 0.41         | 0.21   | 0.43|
| Beverages                                       | 1.32      | 1.97    | 0.49       | 0.57         | 4.30   | 0.72|
| Tobacco                                         | 31.40     | 5.15    | 0.69       | 0.12         | 0.24   | 0.90|
| Textiles                                        | 0.95      | 1.60    | 0.47       | 0.34         | 0.13   | 0.26|
| Clothing, except Footwear                       | 1.05      | 0.79    | 0.36       | 0.18         | 0.20   | 0.38|
| Leather and Products from Leather               | 0.51      | 0.77    | 0.70       | 0.28         | 0.10   | 0.66|
| Footwear                                        | 0.38      | 0.59    | 0.60       | 4.01         | 0.29   | 0.45|
| Wood and Wood and Cork Products                 | 0.85      | 1.12    | 2.25       | 0.20         | 0.31   | 0.49|
| Furniture                                       | 1.15      | 0.70    | 0.45       | 0.31         | 0.23   | 0.43|
| Paper and Paper Products                        | 0.51      | 2.65    | 2.12       | 0.18         | 1.43   | 0.69|
| Printing, Publishing and Allied Industries      | 1.70      | 4.96    | 1.14       | 0.49         | 0.66   | 0.34|
| Coal and Refined Petroleum                      | 0.32      | 0.33    | 0.32       | 0.22         | 0.64   | 0.92|
| Basic Chemicals                                 | 13.77     | 1.76    | 0.96       | 0.35         | 6.70   | 0.49|
| Other Chemicals                                 | 1.37      | 1.28    | 1.37       | 0.33         | 0.37   | 0.51|
| Rubber Products                                 | 0.61      | 1.49    | 0.47       | 0.61         | 0.11   | 0.66|
| Plastic Products                                | 0.61      | 0.72    | 4.94       | 0.31         | 0.27   | 0.53|
| Glass and Glass Products                        | 0.83      | 0.97    | 0.76       | 0.28         | 0.23   | 0.61|
| Other Non-metals                                | 3.71      | 1.67    | 0.53       | 0.32         | 0.20   | 0.51|
| Basic Iron and Steel Industries                 | 0.53      | 1.64    | 0.45       | 0.78         | 0.22   | 0.67|
| Non-ferrous Metal Basic Industries              | 0.75      | 1.54    | 0.36       | 0.10         | 0.15   | 0.79|
| Metal Products, except Machinery and Equipment   | 1.04      | 1.32    | 2.53       | 0.47         | 0.11   | 0.19|
| Machinery, except Electrical                    | 5.07      | 4.77    | 1.09       | 0.74         | 0.71   | 0.40|
| Electrical Machinery Apparatus                  | 1.36      | 4.14    | 1.00       | 0.45         | 0.47   | 0.31|
| Television, Radio and Communication Equipment   | 2.14      | 3.99    | 1.70       | 0.31         | 0.15   | 0.40|
| Professional and Scientific Equipment           | 0.83      | 3.96    | 0.72       | 0.49         | 0.33   | 0.27|
| Motor Vehicles, Parts and Accessories           | 0.71      | 1.46    | 0.87       | 0.41         | 0.21   | 0.42|
| Transport Equipment                             | 4.01      | 3.22    | 1.42       | 0.71         | -0.01  | 0.54|
| Other Manufacturing Industries                  | 1.20      | 1.29    | 0.70       | 0.68         | 0.64   | 0.43|

Authors’ calculations.
3 Digit Sectors used as in Fedderke and Hill(2011).
The consistent cross-sector pattern is that average markups are inversely correlated to the size of firms. This is evident in Figure 1 which shows the estimated density function for three years average markups for firms of different asset class. The figure shows the heterogeneity of markups and the relationship between markups and dimension of the firm, where smaller firms have higher and more dispersed markups.

### 3.3 Comparison to previous studies

Although this is the first study to use disaggregated firm-level data on a scale that is comprehensive, and not limited only to listed firms, to compute markups in South Africa, other studies have estimated markups using more aggregated data. Fedderke and Hill (2011) for example use data from the Trade & Industrial Policy Strategies (TIPS) database to estimate markups across manufacturing sectors, but do so strictly at the sectoral level. We compare our computations of markups with their estimates in Table 6. The computed three-
year-average markup appears to be different in most sectors to prior estimates. Fedderke and Hill (2011) find average markups across all sectors ranging from a high of 0.79 for the years 1970-1980 to a low of 0.5 for the years 1974-1984. This is consistent with our three-year average markup of 0.71. However, on average the sectoral markups we have computed for 2010-12 appear in most cases to be lower than the earlier sectoral estimates, suggesting that the liberalizing economic policies of South Africa may have put downward pressure on markups over time. A relative ranking of sectors is shown in Figure 2.
| Sector                                         | 1985-94 | 1991-00 | 1995-04 | 2010-12 | 1985-95 ratio |
|-----------------------------------------------|---------|---------|---------|---------|---------------|
| Food and Food Products                        | 0.73    | 1.28    | 1.85    | 0.72    | 0.99          |
| Beverages                                     | 2.11    | 2.09    | 3.56    | 1.79    | 0.85          |
| Tobacco                                       | -2.06   | -0.45   | -76.29  | 0.58    | -0.28         |
| Textiles                                      | 0.66    | 1.23    | 1.31    | 0.35    | 0.53          |
| Clothing, except Footwear                    | 0.36    | -1.06   | -0.50   | 0.26    | 0.72          |
| Leather and Products from Leather            | 0.30    | 0.60    | -0.54   | 0.20    | 0.67          |
| Footwear                                      | 0.17    | -0.04   | 0.13    | 3.75    | 22.06         |
| Wood and Wood and Cork Products              | 1.07    | 0.64    | 0.39    | 0.56    | 0.52          |
| Furniture                                     | 0.20    | 0.03    | 0.12    | 0.33    | 1.65          |
| Paper and Paper Products                     | 4.45    | 2.30    | 2.14    | 0.93    | 0.21          |
| Printing, Publishing and Allied Industries   | 0.60    | -0.30   | -0.48   | 0.90    | 1.5           |
| Coal and Refined Petroleum                   | 1.99    | -14.32  | -17.75  | 0.60    | 0.30          |
| Basic Chemicals                              | 0.89    | 2.27    | 1.38    | 0.97    | 1.09          |
| Other Chemicals                              | 0.91    | 1.60    | 1.47    | 0.32    | 0.35          |
| Rubber Products                              | 0.40    | 0.44    | -2073.24| 0.10    | 0.25          |
| Plastic Products                             | 2.30    | 0.59    | -0.60   | 0.53    | 0.23          |
| Glass and Glass Products                     | 0.66    | 0.69    | -2.51   | 0.56    | 0.85          |
| Other Non-metals                             | -0.73   | 1.98    | 3.56    | 0.33    | -0.45         |
| Basic Iron and Steel Industries              | 0.36    | -0.26   | 2.18    | 0.38    | 1.06          |
| Non-ferrous Metal Basic Industries           | 1.47    | -5.19   | -7.48   | 0.11    | 0.07          |
| Metal Products, except Machinery and Equipment| 0.33    | 0.41    | 1.54    | 0.75    | 2.27          |
| Machinery, except Electrical                 | 0.53    | 0.01    | 0.23    | 0.52    | 0.98          |
| Electrical Machinery Apparatus               | 0.29    | 0.29    | 0.36    | 0.35    | 1.21          |
| Television, Radio and Communication Equipment| -0.94   | -2.37   | -4.36   | 0.31    | -0.33         |
| Professional and Scientific Equipment        | 0.85    | 1.60    | 2.33    | 0.42    | 0.49          |
| Motor Vehicles, Parts and Accessories        | 0.30    | -1.95   | -0.80   | 0.75    | 2.5           |
| Transport Equipment                          | 0.46    | -2.43   | -3.00   | 0.46    | 1             |
| Other Manufacturing Industries               | 3.30    | 5.07    | 4.44    | 0.67    | 0.20          |

Authors’ calculations.
3 Digit Sectors used as in Fedderke and Hill(2011).
1985 to 2004 data taken from Fedderke and Hill (2011)
3.4 International comparisons

In this section we compare markups in South Africa with comparable markups computed using the same methodology and type of data. Tamminen (2013) uses tax data from Finnish firms for the years 2005 to 2009 and computes markups for each firm. In Table 7 we compare average markups between South Africa and Finland for comparable sectors. In most cases average markups in South Africa appear higher than comparable sectors in Finland although there are cases were the markups are about the same or lower. A relative ranking of sectors is shown in Figure 3. Figure 3 shows the absolute difference in markups for each comparable sector.
Table 7: Average markups in Finland vs South Africa

| Industry                                | Finland | South Africa |
|-----------------------------------------|---------|--------------|
| Wood and Wood Products                  | 0.38    | 0.56         |
| Publishing and Printing                | 0.56    | 0.90         |
| Coke and Refined Petroleum             | 0.58    | 0.60         |
| Chemicals                              | 0.55    | 0.78         |
| Rubber and Plastics                    | 0.45    | 0.41         |
| Glass and Ceramics                     | 0.51    | 0.56         |
| Metal Products                         | 0.48    | 0.76         |
| Machinery                              | 0.45    | 0.52         |
| Electronics                            | 0.40    | 0.34         |
| Medical, Testing and Optical Equipment | 0.48    | 0.42         |
| Non-Ferrous Metals                     | 0.82    | 0.11         |
| Food Products and Beverages            | 0.46    | 1.29         |
| Textiles, Clothes and Shoes            | 0.43    | 0.45         |
| Paper and Paperboard                   | 0.41    | 0.93         |
| Iron and Steel                         | 0.49    | 0.38         |
| Cars and Other Transport Equipment     | 0.38    | 0.75         |
| Furniture                              | 0.40    | 0.33         |

Authors’ calculations.
3 Digit Sectors used as in Fedderke and Hill (2011).
Data on Finland taken from Tamminen (2013).

4 Measuring competitiveness of South African manufacturing sectors

In this section we move our attention to the calculation of market concentration in the South African manufacturing sectors. Market concentration and competition is an important topic in economics. It is often seen as one of the better ways to measure the extent of oligopoly in industry. Although concentration is not the only index of oligopoly or market power, changes in concentration are important because it measures, to some extent, a change in the structure of industry. Due to unavailability of adequate data, studies on market concentration in South Africa have been few and far between. Du Plessis (1978), Fourie and Smith (1989), Leach (1992) and Fedderke and Szalontai (2009) are the only major studies
with estimates on market concentration in South Africa. Prior estimates of market concentration in South Africa had been computed using data from the census of manufacturing compiled by Statistics South Africa (StatsSA). Fedderke and Naumann (2011) is the exception. Instead, for the 2001 data point they use data from the Large Sample Survey of the Manufacturing Industry published by StatsSA, thus using a data set which differs in terms of data collection methodology from the manufacturing census data of earlier studies, and the tax records employed for the present paper.

In general, the estimates from earlier studies suggest a relatively high level of concentration in South Africa. Du Plessis (1978) for instance finds exceptionally high levels of concentration with 9 of 30 industry main groups categorized as highly concentrated in 1972. Fourie and Smit (1989) find that concentration was indeed high and rising. They show an increase in relative concentration between 1972 and 1982 and that the majority of industries showed a persistent increase in concentration. Fedderke and Szalontai (2009) extend the work of Fourie and Smit (1989) to 1996 and show that concentration was indeed still high and rising across a wide range of industries. Fedderke and Naumann (2011), using the Large Sample Survey data set, find significantly lower levels of concentration across most industries in 2001.

The availability of firm-level balance-sheet data allows us to extend prior research by computing an array of measures of market concentration. We calculate 5 percent, top four firms, and top eight firms concentration ratios as well as the Herfindahl-Hirschman Index (HHI) for the top 50 firms and all firms in each category. We compute these for all years between 2010 and 2012. We find significantly higher levels of market concentration across almost all sectors when compared with earlier studies.

### 4.1 Concentration ratios

The concentration ratios and HHI are calculated using the market share of firms in each industrial category. Market share is defined as the fraction of sales of firm $i$ to total sales
in category $j$ in each year. The primary data for market share for firms is obtained from balance sheet data submitted by firms to the South African Revenues Service (SARS).

The balance sheet data allows us to compute market shares using sales for each firm in each industrial classification category. The market shares allow us to compute the concentration ratios and the HHI for each industrial category.

Concentration ratios are calculated as the cumulative percentage market share of the top $n$ firms by sales in category $j$. To allow for comparison with earlier measures of industry concentration in South Africa, and with international standard measures of concentration we compute concentration ratios based on the market share of the top 5 percent of firms, the top four firms, and the top eight firms based on each 3-digit Standard Industrial Classification (SIC) category as in Fedderke and Naumann (2011).

Table 8 reports the concentration ratios for the top 5 percent of firms in each 3-digit SIC category as in Fedderke and Szalontai (2009) and Fedderke and Naumann (2011). Concentration ratios for 1976, 1985, and 1996 are taken from Fedderke and Szalontai (2009). These concentration ratios were calculated using aggregate industry from the census of manufacturing. Concentration ratios for 2001 are taken from Fedderke and Naumann (2011) and were calculated using the large sample survey of South African manufacturing.
Table 8: Concentration Ratio of Top 5% of firms by market Share

|                          | 1976  | 1985  | 1996  | 2001  | 2010  | 2011  | 2012  |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|
| Food and Food Products   | 65.29 | 70.12 | 75.16 | 65.93 | 75.63 | 73.51 | 79.72 |
| Beverages                | 55.64 | 62.68 | 74.26 | 76.27 | 92.46 | 91.57 | 93.14 |
| Textiles                 | 52.29 | 55.92 | 48.11 | 36.00 | 60.77 | 60.26 | 62.79 |
| Clothing, except Footwear| 46.75 | 50.58 | 58.68 | 34.18 | 68.47 | 68.22 | 73.89 |
| Leather and Products from Leather | 37.17 | 50.25 | 67.86 | 27.69 | 75.34 | 78.00 | 78.17 |
| Footwear                 | 36.73 | 46.08 | 56.42 | 39.99 | 54.56 | 55.48 | 54.10 |
| Wood and Wood and Cork Products | 51.35 | 63.34 | 61.10 | 38.45 | 63.08 | 70.35 | 65.32 |
| Furniture                | 53.39 | 52.12 | 58.38 | 56.68 | 62.28 | 63.98 | 64.69 |
| Paper and Paper Products | 53.36 | 75.43 | 62.05 | 78.13 | 85.55 | 85.22 | 85.17 |
| Printing, Publishing and Allied Industries | 60.99 | 62.45 | 69.25 | 48.90 | 71.28 | 70.45 | 73.46 |
| Basic Chemicals          | 69.55 | 62.88 | 70.79 | 68.55 | 75.66 | 78.80 | 86.04 |
| Other Chemicals          | 71.32 | 47.99 | 63.43 | 82.76 | 83.08 | 78.15 |
| Rubber Products          | 55.97 | 66.16 | 80.85 | 40.33 | 77.44 | 75.70 | 72.46 |
| Plastic Products         | 36.55 | 46.63 | 56.67 | 30.22 | 79.39 | 81.25 | 61.48 |
| Glass and Glass Products | 53.46 | 85.40 | 87.31 | 69.74 | 61.99 | 77.32 | 76.79 |
| Other Non-metals         | 69.60 | 75.83 | 74.96 | 60.07 | 71.52 | 73.11 | 70.44 |
| Basic Iron and Steel Industries | 73.48 | 76.93 | 69.89 | 76.00 | 83.26 | 83.67 | 82.49 |
| Non-ferrous Metal Basic Industries | 47.60 | 63.07 | 64.66 | 70.60 | 88.45 | 89.23 | 87.55 |
| Metal Products, except Machinery and Equipment | 58.48 | 65.47 | 67.34 | 47.49 | 60.52 | 58.46 | 60.13 |
| Machinery, except Electrical | 56.14 | 60.24 | 61.79 | 38.41 | 69.86 | 75.01 | 82.47 |
| Electrical Machinery Apparatus | 60.77 | 66.58 | 58.26 | 51.60 | 78.76 | 77.84 | 75.36 |
| Motor Vehicles, Parts and Accessories | 79.42 | 83.90 | 85.19 | 78.87 | 84.01 | 84.97 | 87.19 |
| Transport Equipment      | 68.01 | 73.37 | 75.27 | 58.99 | 70.60 | 76.29 | 75.97 |
| Other Manufacturing Industries | 53.15 | 59.90 | 83.38 | 50.66 | 61.88 | 76.60 | 79.44 |

Source: Authors’ calculations.
3-Digit Industrial Classification as in Fedderke and Szalontai (2009) used.
1976 to 1996 data taken from Fedderke and Szalontai (2009). 2001 data taken from Fedderke and Naumann (2011).
The data shows variation in concentration and change in concentration depending on the industry. On average concentration appears to be higher across most industrial categories compared to concentration before 2001. In 1976, five out of 24 sectors had concentration levels with market share of the top 5 percent of firms falling below 50 percent. In 1985 only three industrial categories had concentration below the 50 percent mark. In 1996 only one category had concentration levels below 50 percent. Continuing the trend, none of the manufacturing sectors between 2010 and 2012 had concentration levels below the 50 percent mark. This suggests that concentration levels have risen on average across South African manufacturing. Exceptions can be made for a few categories where concentration can be said to have been stable since the 1990s. The Food and food products industry for instance shows concentration steadily averaging about 75 percent from the 1990s through 2012. The Footwear industry also shows concentration levels stable at about 55 percent through the same period. Other non-metals and Motor vehicle, parts and accessories sectors also appear stable from the 1990s through to the contemporary era. Two sectors that have shown a relative decline in concentration though from relatively high levels of concentration, are the Rubber products and Metals products categories where concentration appears to have fallen since the 1990s.

The changes in relative concentration can be more clearly seen in Figure 4. Figure 4 shows the percentage point increase in concentration across all sectors between 1996 and the average of 2010 through 2012. As shown, the majority of sectors show an increase in the levels of concentration. Considering that concentration was already thought to be high and rising between the 1970s and 1990s (Fedderke and Szalontai, 2009), the new data suggests that the increase in concentration has continued until the current period.

The measures of concentration ratios in 2001 computed by Fedderke and Naumann (2011) using the large sample survey of South African manufacturing appear to be very different to the concentration measures recorded for other time periods. This suggests that the aberration is due to the data collection methodology, which was less universal in coverage than the
manufacturing census or the tax record data. As shown in Table 8, the concentration ratios for most sectors in 2001 appears to markedly lower in most sectors.

Tables 9 and 10 report the concentration ratios for the top four and top eight firms in each category respectively. Concentration ratios are computed for all the years from 2010 through 2012.

Again the heterogeneity of concentration across sectors is notable. The Beverages, Tobacco, and Leather products industries for instance show high degrees of concentration with the top 4 firms accounting for over 40 percent of sales in all years, and the top 8 accounting for over 60 percent of sales. On the other hand, Textiles, Metal products, and Electrical machinery and apparatus, show concentration ratios below 20 percent in most years.

The standard classification combines a lot of industries together. Not all industries in each category produce the same type of products. In essence the industry-level concentration ratio might disguise higher levels of concentration if firms in the categories produce different types of products. The SARS data provides the finer 4-digit industrial classification which
allows us to measure concentration at a much finer level. Although there are too many categories to list individually, Figure 5 shows a distribution of concentration ratios for the top eight firms for 2010 through 2012. As shown in the distributions, most categories have concentration ratios above 50 with averages between 60 and 80 per cent. The distribution highlights high levels of concentration across most sectors.

4.2 Herfindahl-Hirschman index

In international literature, concentration measures such as the HHI have become the most widely used. The HHI is defined as:

$$HHI = \sum_{i=1}^{N} M_i^2$$  \hspace{1cm} (5)

where $M_i$ is the market share of firm $i$, and $N$ denotes the number of firms in the industry. The HHI has the advantage of taking into account the total number of firms in the industry.
in calculating concentration.

Table 6 reports the HHI for the top 50 firms in each standard industrial classification. The data suggest differences in concentration across different categories similar to the concentration ratios. Some sectors have low levels of concentration such as the Clothing and footwear sector, and the Machinery and related items sector.

### 4.3 International comparisons

The country-specific nature of industrial classifications make cross-country comparisons difficult. However, the disaggregated nature of the firm-level tax data allows us to reclassify South African firms based on other classification standards. To this effect we re-classify South African firms based on the North American Industrial Classification System (NAICS). This will allow the comparability of market concentration in South Africa with concentration in other countries who use the NAICS.

Table 11 compares the HHI based on the NAICS for the United States (US) in 2007 and 2012, and South Africa for the years 2010 to 2012. The data show higher levels of market concentration in almost all industries with a few exceptions. To get a sense of the divergence in HHI, Figure 6 shows the difference between HHIs for comparable sectors in 2012.

In almost all cases South Africa shows a higher index suggesting higher levels of concentration. The exceptions are the Transportation equipment manufacturing sector which is less concentrated in South Africa, and the Electric equipment sector which shows about the same level of concentration. An examination of the distribution of HHI based on the 3-digit and the finer 4-digit NAICS classification shows significant differences in the distribution of market concentration. Figure 7 shows the distribution of HHI for 3-digit categories while Figure 8 shows the distribution of HHI for 4-digit categories. Both cases highlight the differences in concentration between the US and South Africa, with concentration higher in the later.

It is likely that the level of concentration in the United States represents a lower bound
Figure 6: Concentration index comparison US-South Africa (Source: Authors’ calculations)

Figure 7: HH Index comparison by 3-digit code (source: Authors’ calculations)
in the distribution of concentration across countries, but it is nevertheless an important benchmark in evaluating South African market structure.

5 Markups, concentration and entry-exit of firms

The previous descriptive analysis shows a static picture of South African market structure. While we can with a certain confidence suggest that the manufacturing sectors in South Africa are characterized by relatively high markups and low competitive pressure, we cannot yet make any causal statement. Although there are limitations to the data, specifically due to the absence of foreign trade and labour data, in this section we examine the nature of the correlation between markups and concentration. We also examine the relationships between the market structure and the entry and exit of firms, one the fundamental mechanisms of economic growth. Finally we highlight the importance of barriers to entry in understanding the nature of high markups and concentration.
5.1 Markups and concentration

The first correlation we look at is the direct relation between markups and concentration. Table 13 classifies the different sectors according to their degree of concentration and markups.
| Table 9: Concentration ratio of top 4 by market share | 2010  | 2011  | 2012  |
|-----------------------------------------------------|------|------|------|
| Food and Food Products                              | 30.01| 30.53| 38.42|
| Beverages                                           | 58.22| 58.13| 54.17|
| Tobacco                                             | 90.12| 65.04| 80.85|
| Textiles                                            | 20.86| 19.16| 18.05|
| Clothing, except Footwear                           | 28.96| 27.08| 27.87|
| Leather and Products from Leather                   | 42.75| 46.18| 41.45|
| Footwear                                            | 33.89| 33.80| 28.53|
| Wood and Wood and Cork Products                     | 31.78| 39.52| 36.01|
| Furniture                                            | 35.94| 38.96| 36.93|
| Paper and Paper Products                            | 59.89| 56.41| 56.85|
| Printing, Publishing and Allied Industries           | 22.07| 22.98| 29.13|
| Coal and Refined Petroleum                          | 81.68| 82.22| 86.15|
| Basic Chemicals                                      | 28.77| 29.34| 55.22|
| Other Chemicals                                      | 41.11| 42.58| 34.08|
| Rubber Products                                      | 53.39| 52.45| 52.20|
| Plastic Products                                     | 58.18| 59.16| 23.64|
| Glass and Glass Products                            | 41.17| 64.11| 61.16|
| Other Non-metals                                     | 34.01| 34.22| 38.27|
| Basic Iron and Steel Industries                     | 54.68| 54.15| 53.33|
| Non-ferrous Metal Basic Industries                  | 62.64| 60.64| 64.52|
| Metal Products, except Machinery and Equipment       | 15.74| 11.96| 12.89|
| Machinery, except Electrical                        | 18.57| 23.22| 42.54|
| Electrical Machinery Apparatus                      | 19.97| 18.88| 19.07|
| Television, Radio and Communications Equipment      | 23.20| 25.36| 37.22|
| Professional and Scientific Equipment                | 16.26| 16.65| 14.54|
| Motor Vehicles, Parts and Accessories                | 29.03| 28.21| 27.25|
| Transport Equipment                                  | 31.90| 38.49| 40.93|
| Other Manufacturing Industries                      | 15.83| 45.47| 50.30|

Authors’ calculations.
7th Edition Standard Industrial Classification Used.
Table 10: Concentration ratio of top 8 by market share

| Product Category                              | 2010  | 2011  | 2012  |
|-----------------------------------------------|-------|-------|-------|
| Food and Food Products                        | 39.22 | 40.21 | 48.24 |
| Beverages                                     | 72.97 | 72.83 | 69.74 |
| Tobacco                                       | 96.79 | 81.43 | 91.67 |
| Textiles                                      | 26.70 | 25.78 | 25.75 |
| Clothing, except Footwear                    | 38.80 | 37.01 | 36.69 |
| Leather and Products from Leather             | 64.68 | 68.50 | 64.94 |
| Footwear                                      | 45.78 | 46.22 | 42.25 |
| Wood and Cork Products                        | 44.40 | 53.72 | 48.37 |
| Furniture                                     | 41.10 | 44.09 | 42.81 |
| Paper and Paper Products                      | 72.39 | 67.87 | 66.93 |
| Printing, Publishing and Allied Industries    | 31.48 | 32.24 | 39.58 |
| Coal and Refined Petroleum                   | 93.32 | 92.95 | 90.34 |
| Basic Chemicals                               | 41.52 | 42.39 | 63.97 |
| Other Chemicals                               | 51.53 | 52.92 | 47.70 |
| Rubber Products                               | 67.85 | 67.30 | 63.26 |
| Plastic Products                              | 62.36 | 64.39 | 31.70 |
| Glass and Glass Products                      | 46.92 | 68.53 | 66.99 |
| Other Non-metals                              | 50.02 | 50.79 | 50.81 |
| Basic Iron and Steel Industries               | 66.36 | 67.09 | 66.28 |
| Non-ferrous Metal Basic Industries            | 78.93 | 79.22 | 78.67 |
| Metal Products, except Machinery and Equipment| 20.44 | 16.51 | 18.78 |
| Machinery, except Electrical                  | 30.28 | 37.13 | 54.09 |
| Electrical Machinery Apparatus                | 32.77 | 31.25 | 29.50 |
| Television, Radio and Communications Equipment| 36.59 | 37.30 | 46.70 |
| Professional and Scientific Equipment         | 27.34 | 27.05 | 25.41 |
| Motor Vehicles, Parts and Accessories         | 41.49 | 41.26 | 43.75 |
| Transport Equipment                           | 48.54 | 56.58 | 56.10 |
| Other Manufacturing Industries                | 22.87 | 50.34 | 55.48 |

Source: Authors’ calculations.

7th Edition Standard Industrial Classification Used.
Table 11: HHI of top 50 firms by market share

| Industry                                | 2010 | 2011 | 2012 |
|-----------------------------------------|------|------|------|
| Food and Food Products                  | 388  | 400  | 643  |
| Beverages                               | 1345 | 1551 | 1248 |
| Tobacco                                 | 4984 | 1393 | 3647 |
| Textiles                                | 209  | 167  | 147  |
| Clothing, except Footwear              | 310  | 276  | 272  |
| Leather and Products from Leather      | 639  | 736  | 620  |
| Footwear                                | 380  | 392  | 334  |
| Wood and Cork Products                 | 382  | 568  | 550  |
| Furniture                               | 706  | 792  | 632  |
| Paper and Paper Products               | 1199 | 1141 | 1149 |
| Printing, Publishing and Allied Industries | 206  | 218  | 331  |
| Coal and Refined Petroleum             | 2038 | 2122 | 1935 |
| Basic Chemicals                        | 319  | 334  | 1860 |
| Other Chemicals                        | 708  | 765  | 435  |
| Rubber Products                        | 830  | 823  | 767  |
| Plastic Products                       | 2467 | 2460 | 201  |
| Glass and Glass Products               | 1269 | 1943 | 1739 |
| Other Non-metals                       | 481  | 495  | 545  |
| Basic Iron and Steel Industries        | 1360 | 1254 | 1031 |
| Non-ferrous Metal Basic Industries     | 1317 | 1170 | 1286 |
| Metal Products, except Machinery and Equipment | 88   | 62   | 73   |
| Machinery, except Electrical           | 156  | 225  | 828  |
| Electrical Machinery Apparatus         | 169  | 157  | 144  |
| Television, Radio and Communications Equipment | 225  | 247  | 397  |
| Professional and Scientific Equipment  | 149  | 146  | 130  |
| Motor Vehicles, Parts and Accessories  | 290  | 295  | 294  |
| Transport Equipment                    | 416  | 505  | 703  |
| Other Manufacturing Industries         | 120  | 1615 | 2070 |

Source: Authors’ calculations.

7th Edition Standard Industrial Classification Used.
### Table 12: HHI of top 50 firms by market share

| Industry                                      | US 2007 | US 2012 | 2010  | 2011  | 2012  |
|-----------------------------------------------|---------|---------|-------|-------|-------|
| Food Manufacturing                            | 102.1   | 110.7   | 394   | 371   | 552   |
| Beverage and Tobacco Manufacturing            | 555.4   | 578     | 1347  | 1492  | 1192  |
| Textile Mills                                 | 160.2   | 158.1   | 1102  | 914   | 896   |
| Textile Mill Products                         | 418.6   | 272     | 377   | 391   | 384   |
| Apparel Manufacturing                         | 44      | 54      | 258   | 232   | 251   |
| Leather and Allied Products Manufacturing     | 174.8   | 236.9   | 289   | 291   | 260   |
| Wood Product Manufacturing                    | 38.3    | 42.6    | 512   | 559   | 625   |
| Paper Manufacturing                           | 227.8   | 310.6   | 1199  | 1141  | 1149  |
| Printing and Related Support Activities       | 77.9    | 95.4    | 369   | 425   | 458   |
| Chemical Manufacturing                        | 114     | 107.5   | 281   | 303   | 700   |
| Plastics and Rubber Products                  | 31.3    | 37.1    | 1880  | 1787  | 177   |
| Nonmetallic Mineral Manufacturing             | 89.6    | 54.3    | 352   | 436   | 450   |
| Primary Metal Manufacturing                   | 180.6   | 176     | 767   | 676   | 595   |
| Fabricated Metal Product Manufacturing        | 9       | 10.4    | 88    | 62    | 73    |
| Machinery Manufacturing                       | 72.7    | 90.9    | 156   | 225   | 828   |
| Computer and Electronic Product Manuf         | 136.6   | 71.5    | 233   | 310   | 1175  |
| Electric Equipment, Appliance...              | 105.3   | 113.4   | 118   | 118   | 115   |
| Transportation Equipment Manufacturing        | 365     | 296.3   | 277   | 281   | 284   |
| Furniture and Related Products Manuf          | 61.5    | 73.5    | 438   | 514   | 428   |

Source: Authors’ calculations

North American Industrial Classification System Used. US HHI data taken from the United States Census Bureau, [http://www.census.gov/econ/concentration.html](http://www.census.gov/econ/concentration.html). Accessed on 21 March, 2015.
| Low Concentration | Medium Concentration | High Concentration |
|-------------------|----------------------|--------------------|
| Clothing except Footwear | Food & Food Products Textiles | Footwear Printing, Publishing ... |
| Basic Chemicals | Wood & Wood Products Furniture | Metal Products Motor Vehicles |
| | Machinery Electrical Machinery | |
| | Television, Radios ... Professional & Scientific... | |
| | Other Manufacturing | |
| Leather & Leather... Rubber Products | Other Chemicals Plastic Products | Paper & Paper... |
| | Glass & Glass Products Other Non-Metals | |
| | Basic Iron and Steel Other Manufacturing | |
| | Transport Equipment | |
| High Concentration | Non-Ferrous Metals Tobacco | Beverage |
| | Coal & Petroleum Products | |

1 Source: Authors’ calculations
2 3 Digit Sectors used as in Fedderke and Hill(2011).
3 Low markups defined as markups less than 0.3, medium between 0.3 and 0.7, high above 0.7. Low concentration defined as 8-firm concentration ration below 0.5, medium between 0.5 and 0.7, and high above 0.7.
In the table we compare average markups weighted by total assets in each sector to the level of market concentration in that sector. Market concentration here is defined as the combined market share of the eight largest firms by sales. Again there is much variation across sectors with no clear patterns. The Beverages sector for instance is highly concentrated with markups of the largest firms by assets very high. On the other hand, the Non-ferrous basic metals sector is also very highly concentrated but the markups of the largest firms are relatively low.

It is apparent that there is no clear relationship between markups and market concentration. It is certainly not the case that the high markups are completely explained by high levels of concentration.

5.2 Market structure and entry and exit of firms

Another possible explanation of high markups is absence of entry. The data allow us to calculate the firm birth and death rates for the years 2011 and 2012. Tables 14 and 15 show the calculated birth and death rates by manufacturing sectors and by asset class of the entrants.
Table 14: Average birth rates by asset group - 2011 and 2012

|                        | No Assets | 0 - R1m | R1m - R10m | R10m - R100m | R100m+ | All  |
|------------------------|-----------|---------|------------|--------------|--------|------|
| Food and Food Products | 1.89      | 8.58    | 0.28       | 0.02         | 0      | 10.78|
| Beverages              | 1.14      | 7.21    | 0.69       | 0.11         | 0.15   | 9.31 |
| Tobacco                | 1.28      | 5.50    | 1.79       | 0.57         | 0      | 9.15 |
| Textiles               | 1.41      | 5.44    | 0.38       | 0.03         | 0      | 7.26 |
| Clothing, except Footwear | 1.97   | 11.81   | 0.45       | 0.03         | 0      | 14.27|
| Leather and Products from Leather | 1.52 | 7.57 | 0.69 | 0 | 0 | 9.78 |
| Footwear               | 1.35      | 7.52    | 0.26       | 0            | 0      | 9.13 |
| Wood and Wood and Cork Products | 1.12 | 5.27 | 0.40 | 0 | 0 | 6.79 |
| Furniture              | 1.63      | 4.34    | 0.35       | 0.12         | 0      | 6.44 |
| Paper and Paper Products | 2.08   | 5.42    | 0.42       | 0            | 0.05   | 7.97 |
| Printing, Publishing and Allied Industries | 1.61 | 4.93 | 0.13 | 0.05 | 0 | 6.73 |
| Coal and Refined Petroleum | 1.81  | 3.91   | 0.38       | 0            | 0      | 6.10 |
| Basic Chemicals        | 1.16      | 3.63    | 0.29       | 0            | 0.05   | 5.13 |
| Other Chemicals        | 1.83      | 4.44    | 0.18       | 0.08         | 0      | 6.54 |
| Rubber Products        | 1.06      | 3.12    | 0.82       | 0            | 0      | 4.99 |
| Plastic Products       | 1.03      | 2.11    | 0.70       | 0.20         | 0.05   | 4.10 |
| Glass and Glass Products | 0.25   | 3.85    | 0.34       | 0.17         | 0      | 4.60 |
| Other Non-metals       | 1.73      | 6.61    | 0.42       | 0.08         | 0      | 8.85 |
| Basic Iron and Steel Industries | 1.48 | 3.97 | 0.38 | 0.25 | 0.04 | 6.12 |
| Non-ferrous Metal Basic Industries | 1.47 | 3.83 | 0.67 | 0 | 0 | 5.97 |
| Metal Products, except Machinery and Equipment | 1.45 | 2.41 | 0.23 | 0.04 | 0 | 4.14 |
| Machinery, except Electrical | 1.72 | 3.06 | 0.31 | 0 | 0.02 | 5.10 |
| Electrical Machinery Apparatus | 1.98 | 2.65 | 0.27 | 0.03 | 0.01 | 4.94 |
| Television, Radio and Communication Equipment | 1.99 | 2.56 | 0.20 | 0 | 0 | 4.76 |
| Professional and Scientific Equipment | 2.05 | 5.85 | 0.30 | 0 | 0.06 | 8.26 |
| Motor Vehicles, Parts and Accessories | 1.52 | 3.46 | 0.36 | 0.06 | 0 | 5.40 |
| Transport Equipment    | 1.43      | 8.00    | 0.30       | 0.07         | 0      | 9.81 |
| Other Manufacturing Industries | 1.39 | 6.10 | 0.12 | 0.05 | 0.02 | 7.68 |

Source: Authors’ calculations.
3 Digit Sectors used as in Fedderke and Hill(2011).
| Industry                          | No Assets | 0 - R1m | R1m - R10m | R10m - R100m | R100m+ | All  |
|----------------------------------|-----------|----------------|-------------|---------------|--------|------|
| Food and Food Products          | 15.80     | 12.65         | 10.16       | 7.00          | 3.33   | 13.60|
| Beverages                       | 12.60     | 10.63         | 9.01        | 1.56          | 4.29   | 10.49|
| Tobacco                         | 7.68      | 17.38         | 44.44       | 5.00          | 0      | 12.76|
| Textiles                        | 16.2      | 14.64         | 8.19        | 7.22          | 0      | 14.01|
| Clothing, except Footwear       | 23.39     | 15.03         | 12.72       | 3.85          | 33.33  | 17.60|
| Leather and Products from Leather | 17.38    | 15.79         | 7.88        | 2.94          | 0      | 14.84|
| Footwear                        | 11.90     | 13.26         | 10.51       | 2.78          | 0      | 11.34|
| Wood and Wood and Cork Products | 17.17     | 14.95         | 11.46       | 3.125         | 0      | 14.84|
| Furniture                       | 17.29     | 15.28         | 10.48       | 9.92          | 0      | 15.57|
| Paper and Paper Products        | 17.33     | 12.37         | 11.61       | 7.12          | 0      | 13.70|
| Printing, Publishing and Allied Industries | 16.46 | 15.19         | 11.60       | 2.88          | 0      | 14.61|
| Coal and Refined Petroleum      | 10.04     | 11.02         | 7.74        | 3.49          | 7.89   | 9.35 |
| Basic Chemicals                 | 11.21     | 14.30         | 6.80        | 5.04          | 2.77   | 11.01|
| Other Chemicals                 | 18.25     | 16.18         | 10.48       | 4.88          | 7.14   | 15.61|
| Rubber Products                 | 10.94     | 17.26         | 5.09        | 10.12         | 45.00  | 11.75|
| Plastic Products                | 12.46     | 14.38         | 9.13        | 5.81          | 2.17   | 11.58|
| Glass and Glass Products        | 17.47     | 13.98         | 7.31        | 3.57          | 0      | 14.46|
| Other Non-metals                | 16.88     | 11.94         | 13.16       | 18.34         | 2.5    | 13.49|
| Basic Iron and Steel Industries | 14.51     | 16.92         | 11.66       | 12.52         | 3.33   | 13.87|
| Non-ferrous Metal Basic Industries | 12.99   | 21.18         | 6.63        | 15.26         | 0      | 15.00|
| Metal Products, except Machinery and Equipment | 12.47 | 15.91         | 8.47        | 15.64         | 20.67  | 12.11|
| Machinery, except Electrical    | 13.82     | 15.68         | 6.73        | 3.72          | 6.10   | 12.69|
| Electrical Machinery Apparatus  | 13.87     | 16.51         | 8.34        | 5.24          | 7.14   | 13.19|
| Television, Radio and Communication Equipment | 14.88 | 15.58         | 7.50        | 2.88          | 0      | 13.95|
| Professional and Scientific Equipment | 14.74  | 15.03         | 4.49        | 1.75          | 5.56   | 12.30|
| Motor Vehicles, Parts and Accessories | 12.80  | 13.87         | 8.31        | 7.09          | 9.24   | 12.27|
| Transport Equipment             | 18.78     | 13.82         | 12.33       | 22.55         | 0      | 15.46|
| Other Manufacturing Industries  | 16.44     | 13.29         | 8.90        | 13.61         | 5.00   | 13.85|

Source: Authors’ calculations.
3 Digit Sectors used as in Fedderke and Hill(2011).
Two observations are immediately derived from the tables. The first observation is that the majority of entrants are in the small firm category, as is the majority of firm exits. The second observation is that the rate of birth of firms is significant showing a baseline dynamics of entry and exit where exit dominates but still a lot of new firms enter the market each year (between 5 and 10 per cent per year, against a death rate in the period well above 10 per cent). We note that while the fact that the death rate exceed the birth rate of firms is consistent with the rising average concentration of sectors, since our observations are for the 2010-12 period, we cannot separate the effect of the global financial crisis.

On the other hand we can see a large variability in the flows of entry and exit and no obvious correlation with markups. Figure 9 plots the birth rate of firms against the average markups for each 4-digit category.
5.3 Barriers to entry?

While this paper is mainly descriptive, the previous observations show us that the relation between size of the firm, concentration, markups and entry and exit is not linear. It needs a strong theoretical framework to understand the connection between market structure and growth. Given the high levels of concentration witnessed in most manufacturing sectors, the obvious question is how firms are able to maintain such dominant positions.

The data suggests that barriers to entry might play some role in explaining the market structure in South Africa. Figure 10 shows a scatter plot of birth rates against concentration in each 4-digit category. The variation of entry across sectors appears to increase as concentration increases. The observation is more apparent in Figure 11 which plots the growth rate of firms against concentration for each 4-digit category. Growth rate is here defined as the rate of entry of new firms minus the rate of exit of existing firms (and note that this is
less than zero for most observations). In some relatively highly concentrated sectors there is a high amount of entry and exit, while in other concentrated sectors, entry and exit is relatively low.

In terms of the dynamics of markups and concentration, this implies that firms are able to protect their positions in different ways. We hypothesize that in sectors where there are high barriers to entry, firms can maintain higher markups and still face low competitive pressure due to the barriers. However in sectors with low barriers to entry, firms protect their positions by keeping markups very low. This dynamic however will only be present in sectors with relatively higher levels of concentration.

To test this hypothesis we run a simple regression linking markups to concentration and barriers to entry, with average asset size of existing firms as a proxy for fixed-cost barriers of entry. We thus run a regression of the form:
Concentration

| Barriers: Low | Low | High |
|--------------|-----|------|
| Low Barriers: Low | Low markup | Low markup |
| Low Entry | High Entry |
| High Exit |

| Barriers: High | High markups | High markups |
| Low Entry | Low Entry |

Source: Authors’ calculations.

\[ M_i = \beta_0 + \beta_1 C_i + \beta_2 A_i + \beta_3 A_i C_i + \epsilon_i \]  

where \( M_i \) denotes the average markups of existing firms in 4-digit sector \( i \), \( C_i \) is the concentration ratio in sector \( i \), and \( A_i \) is the average size of assets in sector \( i \). We include an interaction between average assets and concentration to capture the impact of highly concentrated and high barriers to entry sectors on markups.

**Table 16: Average markups on concentration and average assets**

| Concentration | 0.00 | (0.17) |
|---------------|------|--------|
| Average Assets | -9.99** | (4.61) |
| Average Assets * Concentration | 10.66** | (4.81) |
| Obs | 125 |
| \( R^2 \) | 0.05 |

Source: Authors’ calculations.

The results, reported in Table 16, confirm the following. First, that there is no direct correlation between markups and concentration. Second, that smaller firms tend to have higher markups than large firms. Third, that sectors with high barriers to entry (high asset requirements) and high concentration tend to have higher markups.
As mentioned earlier, the heterogeneity across sectors implies that the hypothesis about barriers to entry although proving to be the case on average, might not be true for every sector. To examine the sector specific barriers to entry hypotheses, we estimate equation (6) above for each SIC category independently. In this case we use the market share of each firm as a measure of sectoral dominance. The interaction between size of assets and market share serves as the indicator of highly concentrated and high barriers. The results are reported in Table 17. As expected the barriers to entry and markups hypothesis applies to some sectors but not to all sectors. The distribution of sectors which exhibit the barriers to entry and markups relationships is shown in Table 18. We note that sectors that do report the interaction between barriers to entry and concentration predominate in the Chemicals (Basic chemicals, other chemicals, rubber, plastics), Metals (Metal products, other non-metal industries), Machineries and Motor vehicles (Machineries, Electrical machineries, Television, radio etc., Motor Vehicles), Clothing and Textiles (Textiles, Clothing, Footwear) Food and food products and the Printing and publishing industries. This again highlights the heterogeneity in market structure and dynamics across different sectors in South African manufacturing.
Table 17: Barriers to entry - by SIC category

| Category                              | 2011 Interaction | S.E | N  | $R^2$ | Interaction | S.E | N  | $R^2$ |
|---------------------------------------|------------------|-----|----|-------|-------------|-----|----|-------|
| Food and Food Products                | 0.13             | 0.01| 892| 0.01***| 0.00        | 0.00| 1226|       |
| Beverage                              | 0.00             | 0.00| 416| 0.00   | 0.00        | 0.01| 579 |       |
| Tobacco                               | -0.01            | 0.26| 32 | -0.00  | 0.01        | 0.01| 51  |       |
| Textiles                              | 0.19**           | 0.08| 791| 0.11***| 0.00        | 0.01| 1015|       |
| Clothing, except Footwear             | 0.67***          | 0.21| 569| 0.26** | 0.10        | 0.03| 892 |       |
| Footwear                              | 0.40             | 0.48| 139| 0.50*  | 0.28        | 0.03| 204 |       |
| Leather and Leather Pro...            | 0.00             | 0.12| 149| 0.09   | 0.14        | 0.03| 232 |       |
| Wood & Cork Products                  | -0.01            | 0.03| 306| 0.02   | 0.03        | 0.03| 392 |       |
| Furniture                             | 0.15             | 0.10| 648| 0.01   | 0.03        | 0.03| 862 |       |
| Paper and Paper Products              | 0.00             | 0.00| 392| 0.00   | 0.00        | 0.00| 553 |       |
| Printing, Publishing...               | 1.08***          | 0.37| 790| 0.30***| 0.05        | 0.03| 1062|       |
| Basic Chemicals                       | 0.04*            | 0.02| 486| 0.00   | 0.00        | 0.00| 645 |       |
| Other Chemicals                       | 0.05**           | 0.02| 554| 0.01** | 0.005       | 0.04| 644 |       |
| Rubber Products                       | 0.06             | 0.12| 186| 0.11** | 0.04        | 0.03| 239 |       |
| Plastic Products                      | 0.00             | 0.00| 526| 0.06** | 0.03        | 0.03| 680 |       |
| Coal & Refined Petroleum              | -0.00            | 0.00| 258| -0.00  | 0.00        | 0.00| 341 |       |
| Glass & Glass Products                | 0.11             | 0.10| 283| 0.01   | 0.01        | 0.01| 379 |       |
| Other Non Metals                      | 0.01             | 0.01| 531| 0.02*  | 0.01        | 0.01| 684 |       |
| Basic Iron & Steel                    | 0.00             | 0.00| 598| 0.00   | 0.00        | 0.00| 814 |       |
| Non-Ferrous Metals                    | 0.01             | 0.02| 177| 0.00   | 0.00        | 0.00| 239 |       |
| Metal Products except..               | 0.21***          | 0.07| 2097| 0.05***| 0.02       | 0.03| 2444|       |
| Machinery except Electrical           | 0.05**           | 0.02| 1391| 0.01*  | 0.00        | 0.00| 1712|       |
| Electrical Machinery...               | 0.03***          | 0.01| 2365| 0.02***| 0.01       | 0.01| 2770|       |
| Television, Radio ...                 | 0.05***          | 0.02| 911 | 0.04** | 0.02        | 0.02| 993 |       |
| Motor Vehicles, Parts...              | 0.01*            | 0.005| 2862| 0.01** | 0.006       | 0.02| 3811|       |
| Transport Equipment                   | 0.05             | 0.04| 231| 0.03   | 0.02        | 0.02| 297 |       |
| Professional & Scientific..           | 0.09             | 0.08| 346| 0.30   | 0.22        | 0.22| 485 |       |
| Other Manufacturing Industries        | 0.09***          | 0.02| 914 | 0.05***| 0.02       | 0.02| 1179|       |

1 Source: Authors' calculation

1 Notes. ***, ** and * indicate significance at the 1%, 5%, and 10% levels.
| Evidence                                      | No Evidence                                      |
|----------------------------------------------|--------------------------------------------------|
| Food and Food Products                       | Beverage                                         |
| Textiles                                     | Tobacco                                          |
| Clothing, except footwear                    | Leather and leather products                     |
| Footwear                                     | Wood and cork products                           |
| Printing, publishing and allied industries   | Furniture                                        |
| Basic chemicals                              | Paper and paper products                         |
| Other chemicals                              | Coal and refined petroleum                       |
| Rubber products                              | Glass and glass products                         |
| Plastic products                             | Basic iron and steel                             |
| Other non metals                             | Non-ferrous metals                               |
| Metal products, except machinery             | Transport equipment                              |
| Machinery, except electrical                 | Professional and scientific equipment            |
| Electrical machinery apparatus               |                                                  |
| Television, radio, and communications equipment |                                                 |
| Motor vehicles, parts, and accessories       |                                                  |
| Other manufacturing industries               |                                                  |

Source: Authors’ calculations.
6 Conclusions

In this paper we use firm-level tax data to compute markups for manufacturing firms in South Africa. We find much variation in markups across different sectors and across time. The computed markups appear to be significantly different from earlier estimates of markups using aggregate industry data. We find that markups on average are higher in South Africa than markups in Finland. Finally, we find sector specific relations between markups and levels of market concentration and barriers to entry might be one a channel though which firms are able to maintain dominant positions in certain sectors.

This paper extends earlier research on levels of market concentration in South Africa. We use firm-level data to show that concentration levels are higher across majority of industries than was the case in earlier studies. We also show that concentration levels are significantly higher in South Africa compared to the United States.

The paper also opens up room for future research on the determinants of markups, the relationship between markups and firm productivity, the impacts of openness to trade on markups and productivity, and the impacts of sectoral regulation on markups and productivity.

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