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Markups and concentration in South African manufacturing sectors

An analysis with administrative data

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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

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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, especialy 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 385000. 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.

Table 1: Number of firms per year

	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).

Table 2: Average number of firms per year by asset class

	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:

$$\pi_i = TR_i - TC_i = p_i q_i - c_i q_i - FC_i \tag{1}$$

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:

$$p_{ij} = (1 + \mu_i)c_i \tag{2}$$

where μ_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:

$$\mu_i = \frac{(p_i - c_i)}{c_i} \tag{3}$$

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

$$\mu_i = \frac{(p_i - c_i)q_i}{c_i q_i} = \frac{(TR_i - VC_i)}{VC_i} \tag{4}$$

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 the 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

	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).

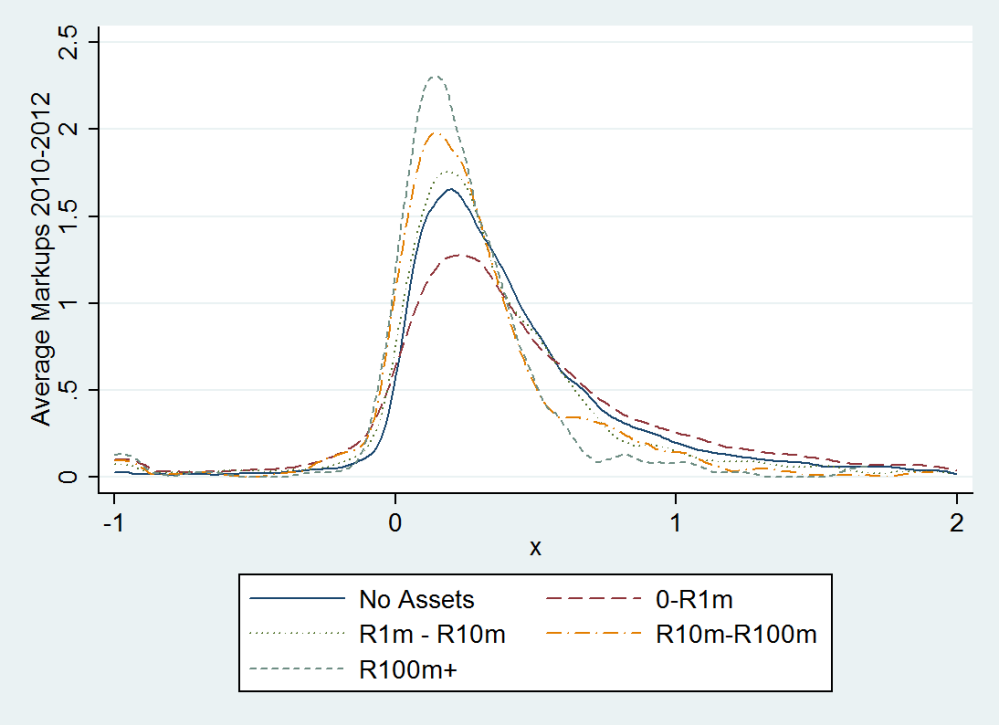
Table 5: Average markups by asset group

	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).

Figure 1: Markup distribution by firm size (Source: Authors' calculations)

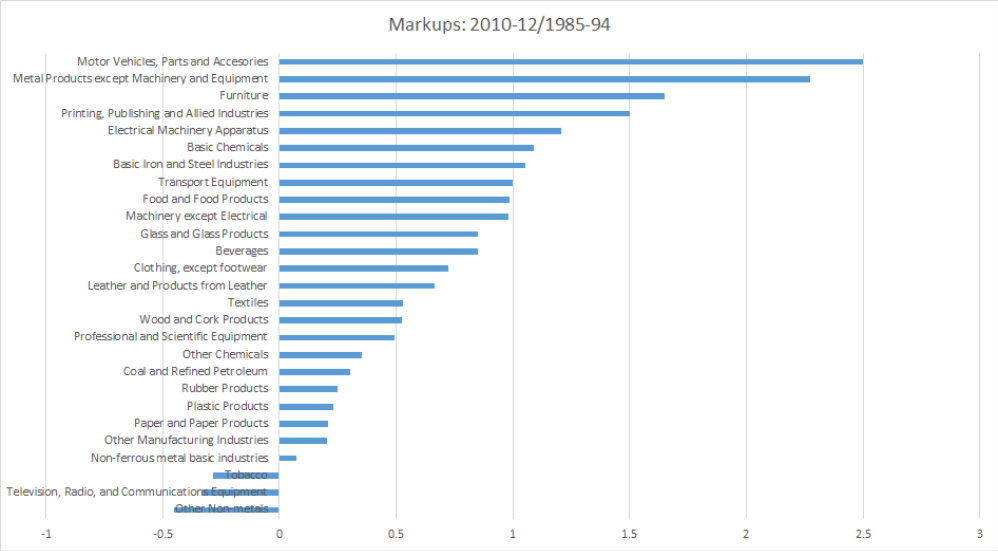


The consistent cross-sector pattern is that average markups are inversely correlated to the size of firms. This is evident in Figure 1 which shows the estimated density function for three years average markups for firms of different asset class. The figure shows the heterogeneity of markups and the relationship 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-

Figure 2: Sectoral markups comparison: 2010-2012 vs Fedderke and Hill 2011 (Source: Authors' calculations



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.

Table 6: Historical markups vs average markups

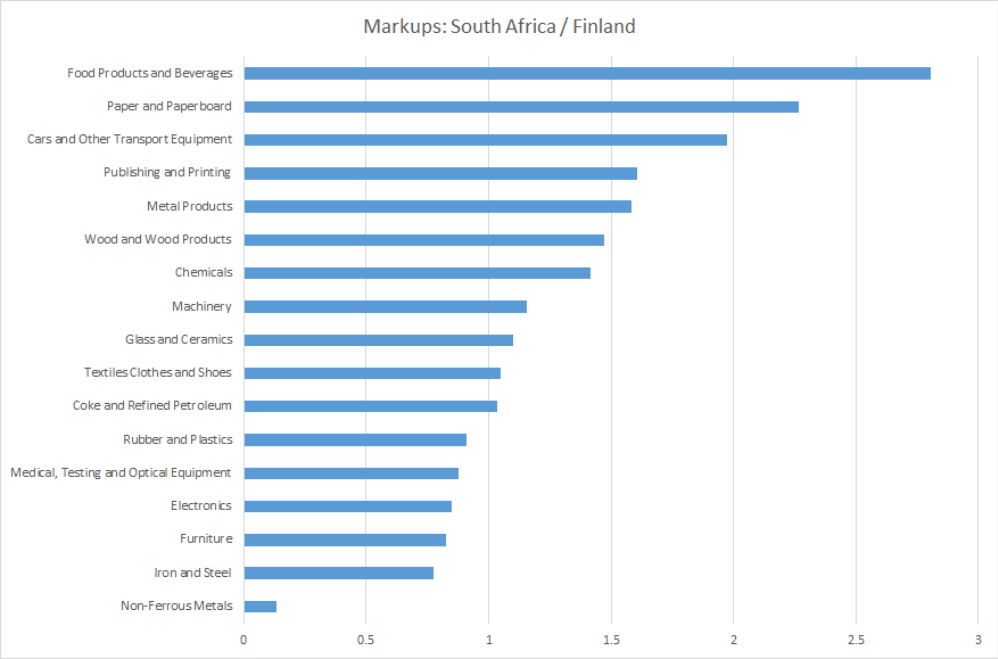
	1985-94	1991-00	1995-04	2010-12	$\frac{2010-12}{1985-95}$ ratio[1]
Food and Food Products	0.73	1.28	1.85	0.72	0.99
Beverages	2.11	2.09	3.56	1.79	0.85
Tobacco	-2.06	-0.45	-76.29	0.58	-0.28
Textiles	0.66	1.23	1.31	0.35	0.53
Clothing, except Footwear	0.36	-1.06	-0.50	0.26	0.72
Leather and Products from 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)

Figure 3: Sectoral markups comparison: Finland-South Africa



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

	Finland	South Africa
	2005 - 2009	2010 - 2012
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 out 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 markets 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 per cent 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.

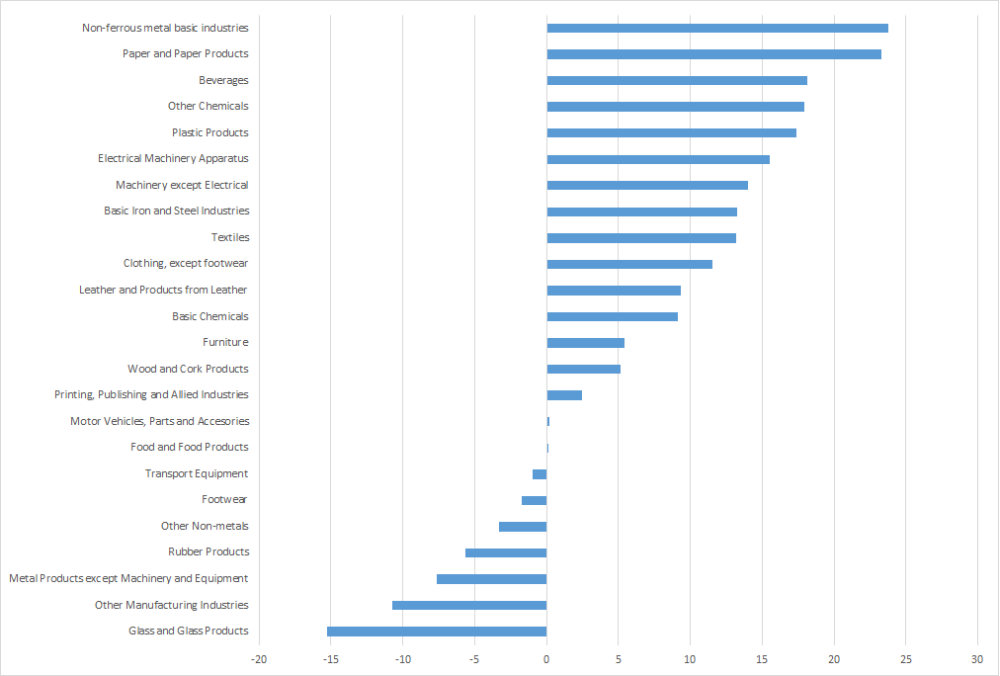
1976 to 1996 data taken from Fedderke and Szalontai (2009). 2001 data taken from Fedderke and Naumann (2011).

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 abberation is due to the data collection methodology, which was less universal in coverage than the

Figure 4: Concentration ratio-comparison (source: Authors' calculations)



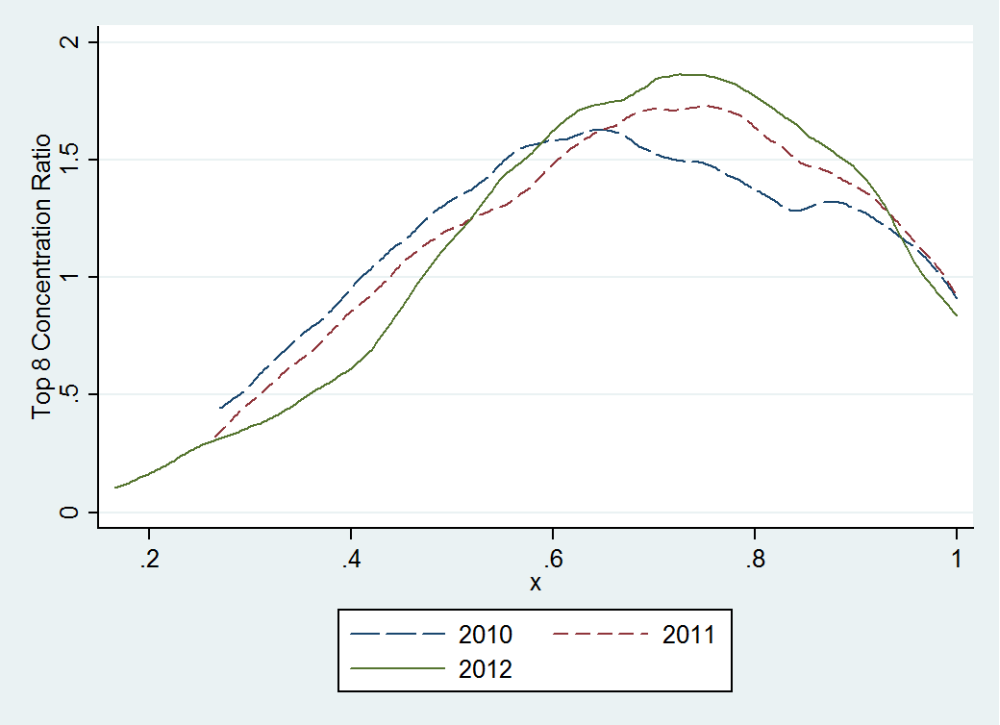
manufacturing census or the tax record data. As shown in Table 8, the concentration ratios for most sectors in 2001 appears to markedly lower in most sectors.

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

Figure 5: Concentration Index 2010-2012 (source: Authors' calculations)



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:

$$HHI = \sum_{i=1}^{N} M_i^2 \tag{5}$$

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)

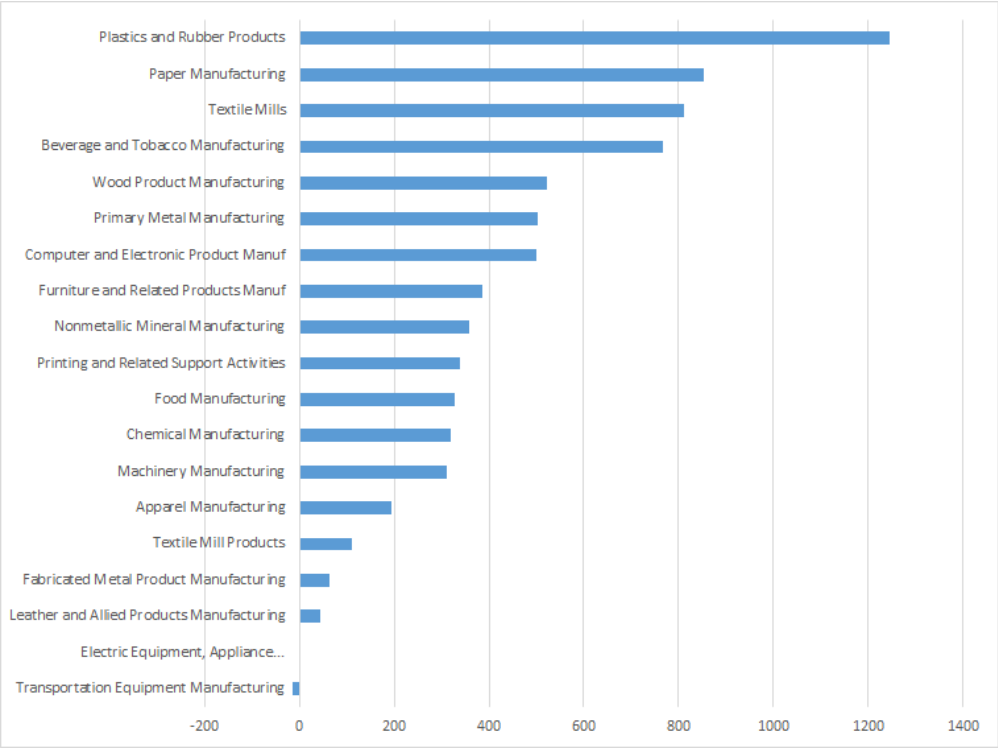


Figure 7: HH Index comparison by 3-digit code (source: Authors' calculations)

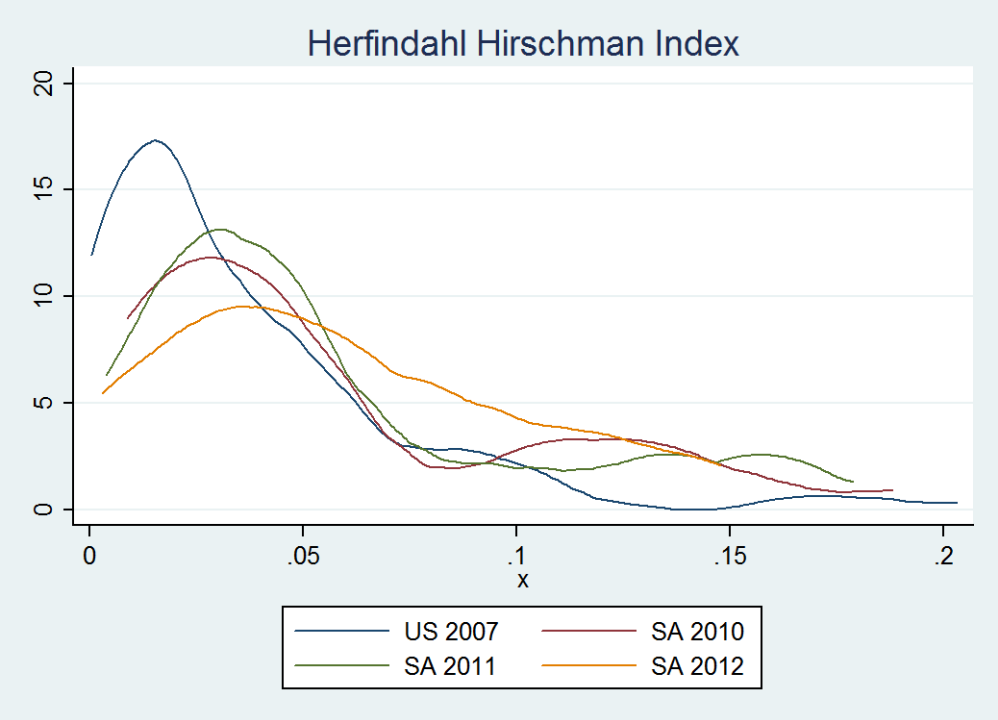
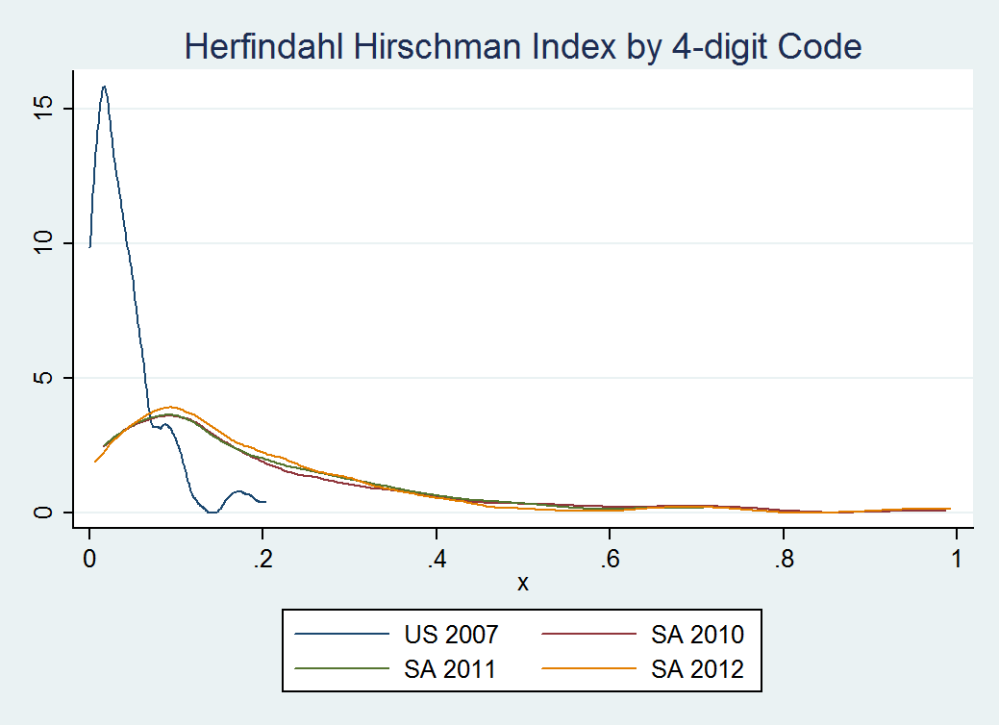


Figure 8: HH Index comparison by 4-digit code (source: Authors' calculations)



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

	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

	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

	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. Accessed on 21 March, 2015.

Table 13: Distribution of sectors

	markups		
	Low	Medium	High
Low Concentration	Clothing except Footwear	Food & Food Products	Footwear
	Basic Chemicals	Textiles	Printing, Publishing ...
		Wood & Wood Products	Metal Products
		Furniture	Motor Vehicles
		Machinery	
		Electrical Machinery	
		Television, Radios ...	
		Professional & Scienc...	
		Other Manufacturing	
Medium Concentration	Leather & Leather...	Other Chemicals	Paper & Paper...
	Rubber Products	Plastic Products	
		Glass & Glass Products	
		Other Non-Metals	
		Basic Iron and Steel	
		Transport Equipment	
High Concentration	Non-Ferrous Metals	Tobacco	Beverage
		Coal & Petroleum Prod...	

[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).

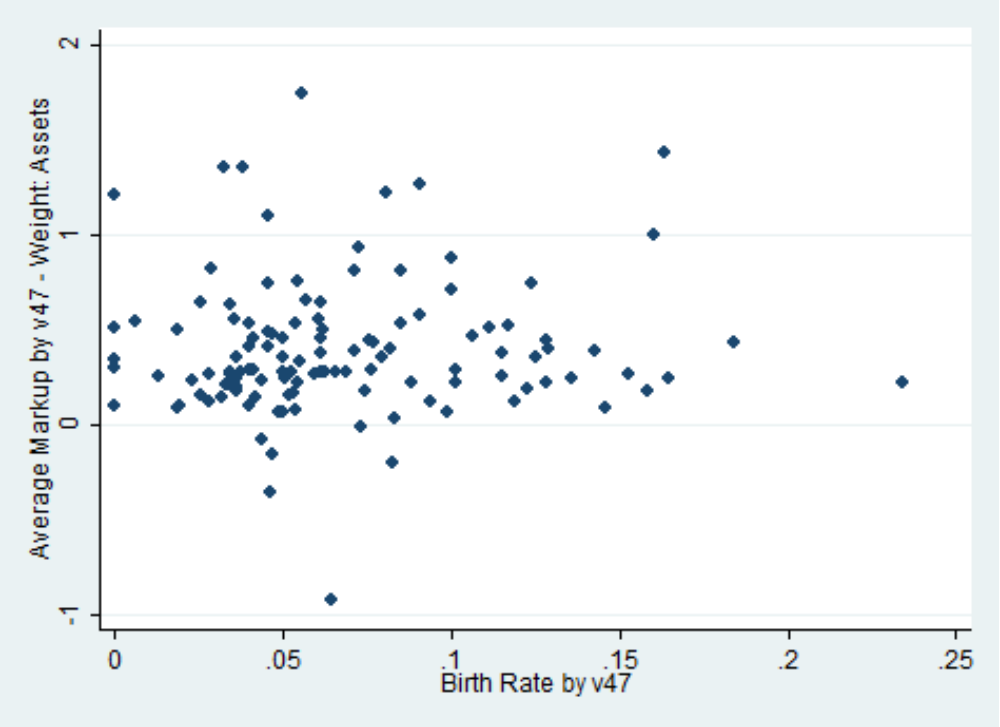
Table 15: Average death rates by asset group - 2010 and 2011

	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 Equi...	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).

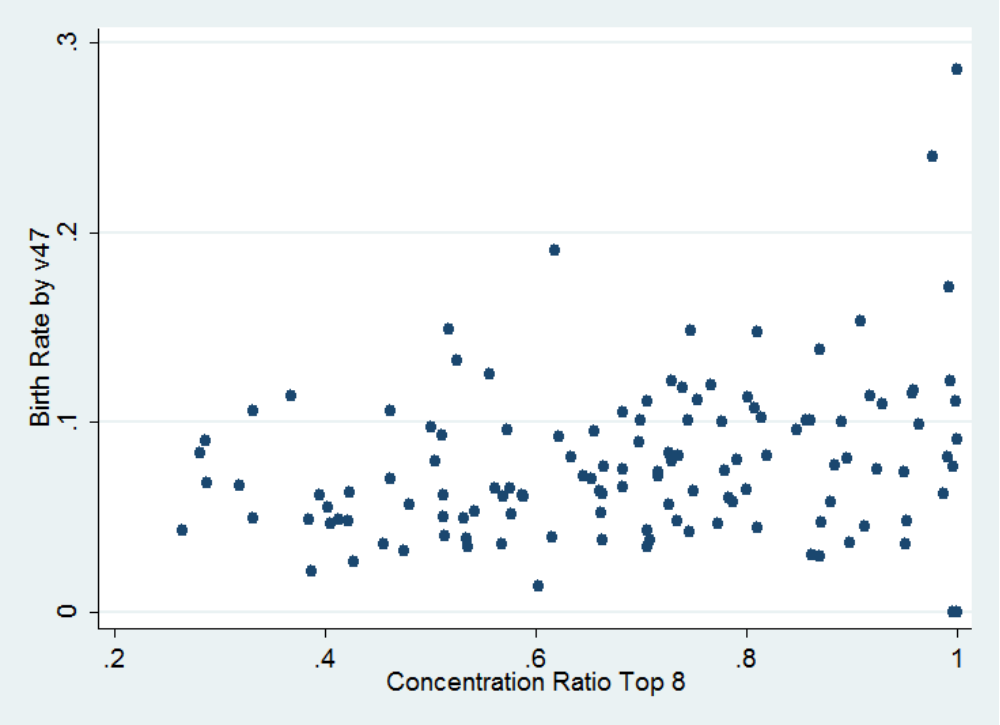
Figure 9: Birth rate vs average markups by 4-digit classification 2012 (source: Authors' calculations)



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.

Figure 10: Birth rate vs concentration by 4-digit classification 2011 (source: Authors' calculations)

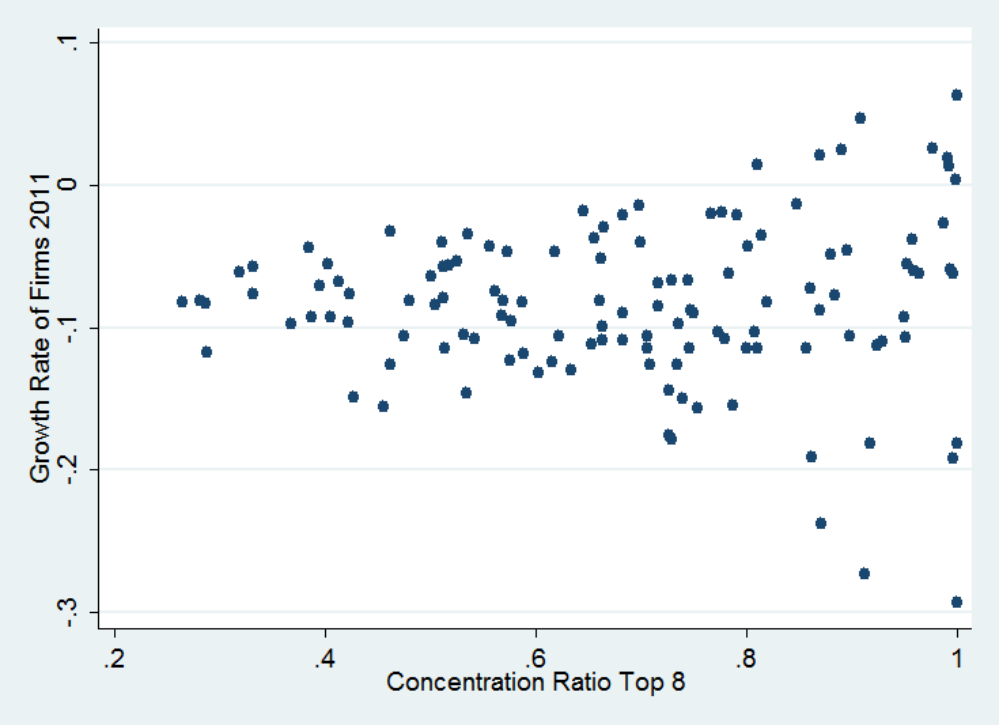


5.3 Barriers to entry?

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

Figure 11: Growth rate vs concentration by 4-digit classification 2011 (source: Authors' calculations)



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	
	Low	High
Barriers: Low	Low markup Low Entry	Low markup High Entry High Exit
Barriers: High	High markups Low Entry	High markups Low Entry

Source: Authors' calculations.

$$M_i = \beta_0 + \beta_1 C_i + \beta_2 A_i + \beta_3 A_i C_i + \epsilon_i \tag{6}$$

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

	2011				2012			
Category	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	1226	
Beverage	**0.00**	0.00	416		**0.00**	0.00	579	
Tobacco	**-0.01**	0.26	32		**-0.00**	0.01	51	
Textiles	**0.19****	0.08	791		**0.11*****	0.03	1015	
Clothing, except Footwear	**0.67*****	0.21	569		**0.26****	0.10	892	
Footwear	**0.40**	0.48	139		**0.50***	0.28	204	
Leather and Leather Pro...	**0.00**	0.12	149		**0.09**	0.14	232	
Wood & Cork Products	**-0.01**	0.03	306		**0.02**	0.03	392	
Furniture	**0.15**	0.10	648		**0.01**	0.03	862	
Paper and Paper Products	**0.00**	0.00	392		**0.00**	0.00	553	
Printing, Publishing...	**1.08*****	0.37	790		**0.30*****	0.05	1062	
Basic Chemicals	**0.04***	0.02	486		**0.00**	0.00	645	
Other Chemicals	**0.05****	0.02	554		**0.01****	0.005	644	
Rubber Products	**0.06**	0.12	186		**0.11****	0.04	239	
Plastic Products	**0.00**	0.00	526		**0.06****	0.03	680	
Coal & Refined Petroleum	**-0.00**	0.00	258		**-0.00**	0.00	341	
Glass & Glass Products	**0.11**	0.10	283		**0.01**	0.01	379	
Other Non Metals	**0.01**	0.01	531		**0.02***	0.01	684	
Basic Iron & Steel	**0.00**	0.00	598		**0.00**	0.00	814	
Non-Ferrous Metals...	**0.01**	0.02	177		**0.00**	0.00	239	
Metal Products except..	**0.21*****	0.07	2097		**0.05*****	0.02	2444	
Machinery except Electrical	**0.05****	0.02	1391		**0.01***	0.00	1712	
Electrical Machinery...	**0.03*****	0.01	2365		**0.02*****	0.01	2770	
Television, Radio ...	**0.05*****	0.02	911		**0.04****	0.02	993	
Motor Vehicles, Parts...	**0.01***	0.005	2862		**0.01****	0.006	3811	
Transport Equipment	**0.05**	0.04	231		**0.03**	0.02	297	
Professional & Scientific..	**0.09**	0.08	346		**0.30**	0.22	485	
Other Manufacturing Industries	**0.09*****	0.02	914		**0.05*****	0.02	1179	

Source: Authors' calculation
[1] Notes. ***, ** and * indicate significance at the 1%, 5%, and 10% levels.

Table 18: Evidence of barriers to entry

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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