Competition and Productivity Growth in South Africa

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Abstract

Using three different panel data sets, we show: (i) that mark-ups are significantly higher in South African manufacturing industries than they are in corresponding industries worldwide; (ii) that competition policy (i.e a reduction of mark-ups) should have largely positive effects on productivity growth in South Africa.

1. Introduction

Recent empirical studies (e.g Nickell (1996), Blundell et al (1999), Aghion et al (2005)), have pointed to a positive effect of product market competition on productivity growth, particularly at low levels of competition. In this paper we explore three different data sets to: (i) first, compare product market competition in South African manufacturing firms and sectors to that in the corresponding sectors worldwide; (ii) second, assess the effect on productivity growth in South Africa of increasing product market competition.

The three data sets are respectively: (i) industry-level panel data for SA and more than 100 countries since the mid-1960s, from UNIDO; (ii) industry-level panel data over the period 1970-2004 from the TIPS database; (iii) firm-level panel data since the early 1980's from publicly listed companies. Product market competition is measured by two alternative formulations of the mark-up of price over the marginal cost of production. Productivity growth is computed either as the growth rate of real local currency value added per worker, or as TFP growth.

Our main findings can be summarized as follows: (a) consistently over the three data sets, mark-ups are significantly higher in South African industries than they are in corresponding industries worldwide. For instance, profitability margins as computed from the listed firms sample, are more than twice as large in South Africa than in other countries on average. Moreover, there is no declining trend in the mark-up differential between SA and other countries over the most recent period; (b) higher past mark ups are associated with lower current productivity growth rates. In particular, a ten percent reduction in SA mark-ups would increase productivity growth in SA by 2 to 2.5% per year; (c) finally, when introducing a quadratic term on the RHS of our growth regression, we find the same kind of inverted-U relationship between competition and growth as for the UK and other countries.

The paper is organized as follows. Section 2 presents a simple model to analyze the relationship between competition and growth, and to describe the "escape competition" effect that underlies the positive correlation between competition and growth. Section 3 presents the empirical methodology, the three data sets and the measures used in our regressions. Section 4 shows the mark-up comparisons. Section 5 presents our growth regressions. Finally, Section 6 provides some conclusions and suggested avenues for further work.

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2. Theory: the escape competition effect

We consider a domestic economy which takes as given the rate of innovation in the rest of the world.[1] Thus the world technology frontier is also moving at a constant rate, with productivity $\overline{A}_t$ at the end of period t, satisfying:

$$\overline{A}_t = \gamma \overline{A}_{t-1},$$

where $\gamma > 1$.

In each country, the final good is produced with a continuum of intermediate inputs and we normalize the labor supply at $L = 1$, so that:

$$y_t = \int_0^1 A_{it}^{1-\alpha} x_{it}^{\alpha} di,$$

where, in each sector i, only one firm produces intermediate input i using the final good as capital according to a one-for-one technology.

In each sector, the incumbent firm faces a competitive fringe of firms that can produce the same kind of intermediate good, although at a higher unit cost. More specifically, we assume that at the end of period t, at unit cost χ, where we assume $1 < \chi < 1/\alpha < \gamma\chi$, a competitive fringe of firms can produce one unit of intermediate input i of a quality equal to $\min(A_{it}, \overline{A}_{t-1})$, where A_{it} is the productivity level achieved in sector i after innovation has had the opportunity to occur in sector i within period t.

In each period t, there are three types of sectors, which we refer to as type-j sectors, with $j \in \{0, 1, 2\}$. A type-j sector starts up at the beginning of period t with productivity $A_{it-1} = \overline{A}_{t-1-j}$, that is, j steps behind the current frontier $\overline{A}_{t-1}$. The profit flow of an incumbent firm in any sector at the end of period t, will depend upon the technological position of that firm with regard to the technological frontier at the end of the period.

Between the beginning and the end of the current period t, the incumbent firm in any sector i has the possibility of innovating with positive probability. Innovations occur step-by-step: in any sector an innovation moves productivity upward by the same factor γ. Incumbent firms can affect the probability of an innovation by investing more in R&D at the beginning of the period. Namely, by investing the quadratic R&D effort $\frac{1}{2}\gamma A_{it-1}\mu^2$ an incumbent firm i in a type-0 or type-1 sector, innovates with probability μ. However, innovation is assumed to be automatic in type-2sectors, which in turn reflects a knowledge externality from more advanced sectors which limits the maximum distance of any sector to the technological frontier.

Now, consider the R&D incentives of incumbent firms in the different types of sectors at the beginning of period t. Firms in type-2 sectors have no incentive to invest in R&D since innovation is automatic in such sectors. Thus

$$\mu_2 = 0,$$

[1] This section borrows unrestrainedly from Aghion-Howitt (2004), which itself builds on Aghion-Harris-Vickers (1997), and Aghion-Harris-Howitt-Vickers (2001).

where μ_j is the equilibrium R&D choice in sector j.

Firms in type-1 sectors, that start one step behind the current frontier at $A_{it-1} = \overline{A}_{t-2}$ at the beginning of period t, end up with productivity $A_t = \overline{A}_{t-1}$ if they successfully innovate, and with productivity $A_t = \overline{A}_{t-2}$ otherwise. In either case, the competitive fringe can produce intermediate goods of the same quality but at cost χ instead of 1, which in turn, as in section 2 above, the equilibrium profit is equal to

$$\pi_t = A_t \delta(\chi),$$

with[2]

$$\delta(\chi) = (\chi - 1)(\chi/\alpha)^{\frac{1}{\alpha-1}}.$$

Thus the net rent from innovating for a type-1 firm is equal to

$$(\overline{A}_{t-1} - \overline{A}_{t-2})\delta(\chi)$$

and therefore a type-1 firm will choose its R&D effort to solve:

$$\max_{\mu}\{(\overline{A}_{t-1} - \overline{A}_{t-2})\delta(\chi)\mu - \frac{1}{2}\gamma\overline{A}_{t-2}\mu^2\},$$

which yields

$$\mu_1 = (1 - \frac{1}{\gamma})\delta(\chi).$$

In particular an increase in product market competition, measured as an reduction in the unit cost χ of the competitive fringe, will reduce the innovation incentives of a type-1 firm. This we refer to as the *Schumpeterian effect* of product market competition: competition reduces innovation incentives and therefore productivity growth by reducing the rents from innovations of type-1 firms that start below the technological frontier. This is the dominant effect, both in IO models of product differentiation and entry, and in basic endogenous growth models. Note that type-1 firms cannot escape the fringe by innovating: whether they innovate or not, these firms face competitors that can produce the same quality as theirs at cost χ. As we shall now see, things become different in the case of type-0 firms.

[2] This, in turn, follows immediately from the fact that

$$\frac{\partial y_t}{\partial x_{it}} = \chi = p_{it},$$

which in turn implies that in equilibrium

$$x_{it} = (\frac{\chi}{\alpha})^{\frac{1}{\alpha-1}} A_{it}.$$

We then simply substitute for x_{it} in the expression for profit π_t, namely

$$\pi_t = (p_{it} - 1)x_{it} = (\chi - 1)(\frac{\chi}{\alpha})^{\frac{1}{\alpha-1}} A_{it}.$$

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Firms in type-0 sectors, that start at the current frontier, end up with productivity $\overline{A}_t$ if they innovate, and stay with their initial productivity $\overline{A}_{t-1}$ if they do not. But the competitive fringe can never get beyond producing quality $\overline{A}_{t-1}$. Thus, by innovating, a type-0 incumbent firm produces an intermediate good which is γ times better than the competing good the fringe could produce, and at unit cost 1 instead of χ for the fringe. Our assumption $\frac{1}{\alpha} < \gamma\chi$ then implies that competition by the fringe is no longer a binding constraint for an innovating incumbent, so that its equilibrium profit post-innovation, will simply be the profit of an unconstrained monopolist, namely:

$$\pi_t = \overline{A}_t \delta(1/\alpha).$$

On the other hand, a type-0 firm that does not innovate, will keep its productivity equal to $\overline{A}_{t-1}$. Since the competitive fringe can produce up to this quality level at cost χ, the equilibrium profit of a type-0 firm that does not innovate, is equal to

$$\pi_t = \overline{A}_{t-1} \delta(\chi).$$

A type-0 firm will then choose its R&D effort to:

$$\max_{\mu}\{[\overline{A}_t \delta(1/\alpha) - \overline{A}_{t-1}\delta(\chi)]\mu - \frac{1}{2}\gamma \overline{A}_{t-1}\mu^2\},$$

so that in equilibrium

$$\mu_0 = \delta(1/\alpha) - \frac{1}{\gamma}\delta(\chi).$$

In particular an increase in product market competition, i.e a reduction in χ, will now have a fostering effect on R&D and innovation. This, we refer to as the *escape competition effect:* competition reduces pre-innovation rents of type-0 incumbent firms, but not their post-innovation rents since by innovating these firms have escaped the fringe. This, in turn. induces those firms to innovate in order to escape competition with the fringe.

The combination of these two effects explains the inverted-U relationship between competition and growth which we observe in most countries. However, if we just look for a linear relationship between productivity growth and product market competition, we generally find that the escape competition effect dominates. Both findings are confirmed when restricting attention to SA industry- or firm-level panel data as we shall see in the next sections.

3. Empirical methodology, data, and measurement

3.1. Productivity growth, pricing power and mark-ups

Our interest lies in the link between productivity growth and competitive pressure in industries. We proceed by the estimation of the general empirical specification given by:

$$Pgrowth_{it} = \alpha + \beta PCM_{it} + I_i + I_t + \varepsilon_{it}, \tag{1}$$

where $Pgrowth_{it}$ denotes a measure of productivity growth in sector i at time t, PCM_{it} is a measure of competitive pressure in sector i, and I_i and I_t stand for industry and year fixed effects.

Two empirical measures for productivity growth are employed in the analysis: labour productivity growth, as well as total factor productivity growth as given by the Solow residual.

The extent of competitive pressure in an industry is proxied by the pricing power evident in the industry. We pay attention to the possibility of alternative measures of pricing power, as well as the existence of a literature devoted to the estimation of the precise magnitude of the mark-up. Thus we follow Aghion et al (2005) in computing the extent of pricing power in an industry directly, by means of a proxy of the Lerner index. The study employs two proxies of the Lerner index, one given by the differential between value added and the total wage bill as a proportion of gross output:

$$PCM1 = \frac{valueadded \; - \; totalwages}{sales} \tag{2}$$

the second as the difference between output and both wage and capital costs as a proportion of output:

$$PCM2 = \frac{pY - wL - rK}{pY} \tag{3}$$

where pY denotes nominal GDP, w the nominal wage rate, L the number of workers, r denotes the nominal interest rate less inflation plus the sectoral depreciation rate of capital, and K the nominal capital stock.

In addition, following the contributions by Hall (1990) and Roeger (1995) we also estimate the magnitude of the mark-up by means of:

$$\begin{aligned} NSR &= \Delta(p+q) - \alpha \cdot \Delta(w+l) - (1-\alpha) \cdot \Delta(r+k) \\ &= (\mu - 1) \cdot \alpha \cdot [\Delta(w+l) - \Delta(r+k)] \end{aligned} \tag{4}$$

where $\mu = P/MC$, with P denoting price, and MC denoting marginal cost. Under perfect competition $\mu = 1$, while imperfectly competitive markets allow $\mu > 1$. Δ denotes the difference operator, lower case denotes the natural log transform, q, l, and k denote real value-added, labour, and capital inputs, and α is the labour share in value-added. Details on methodological issues surrounding the estimation of mark-ups are provided in an Appendix - see section 7. below.

Finally, for firm level data we also add a range of measures of profitability.

3.2. Data

This study employs three distinct sources of data. Confronted with gaps in firm-level data over the past ten years, we use:

1. Industry-level panel data for South Africa and for more than 100 countries since the mid 1960s, obtained from UNIDO's International Industry Statistics 2004. This dataset contains yearly information on output, value added, total wages, and employment for 27 different manufacturing industries in more than 100 countries since the mid 1960s. From these data we compute price-cost margins by means of equation (2). Real labor productivity growth is measured as the growth rate of real local currency value added per worker.

2. Firm-level (Worldscope) evidence from publicly listed companies. The firm-level evidence is based on Worldscope data for publicly-listed companies in 56 different countries since the early 1980s. The dataset contains yearly balance sheet and P&L items, and other basic firm characteristics. Margins are computed by means of equation (2), and real labor productivity growth as the growth rate of real local currency sales per worker. The firm-level data are truncated at the 5% level in order to avoid the results being driven by a few outliers.

3. Industry-level panel data for South Africa from the TIPS database. The data employed for this study focus on the three digit manufacturing industries, over the 1970-2004 period. Variables for the manufacturing sector include the output, capital stock, and labour force variables and their associated growth rates. Data are obtained from the Trade and Industrial Strategies data base. We employ a panel data set for purposes of estimation, with observations from 1970 through 2004. The panel employs data for the 28 three-digit SIC version 5 manufacturing industries in the South African economy for which data is available. The list of sectors included in the panel is that specified in Table 1. This provides a 28×34 panel with a total of 952 observations. For our instrumentation strategy, we employ data on effective rates of protection, scheduled tariff rates, export taxes and a measure of anti-export bias, obtained from Edwards (2005). Unfortunately the instruments are only available over the 1988-2003 period, reducing a 28×16 panel of 448 observations.

One may question our use of two alternative industry-level panel data sets, namely UNIDO and TIPS. However, they offer alternative advantages: the former covers a larger number of countries; the latter provides more detailed data series on South Africa.

INSERT TABLE 1 ABOUT HERE.

There are questions over the reliability of industry data post-1996. Since the last South African manufacturing survey was undertaken in 1996, data post-1996 have been disaggregated from the 2-digit sector level on the basis of a single input-output table. The large sample manufacturing survey of 2001 does not appear to have been incorporated into the data, and moreover the 2001 survey has not released the labour component of the survey. The reliability of the data has suffered as a result of this data collection strategy. This is evident from the evidence presented in Table 2, which reports standard deviations of the computed mark-ups for this study. We report only the standard deviations for computed mark-ups, since the measure summarizes the output, capital and labour dimensions in the manufacturing sector. Standard deviations increase substantially post-1996 for all sectors, and increase even more markedly after 2000. In the instance of some sectors (eg. Rubber products), the increase is of very substantial magnitude. This reflects increased volatility in the underlying series from which the mark-ups are computed.

INSERT TABLE 2 ABOUT HERE.

In interpreting the results that follow, it must be borne in mind that reliability of all results based on industry data are likely to decline substantially after 1996. There is no adequate means of compensating for the absence of data collection for the manufacturing sector, and after having collected manufacturing censuses on a biannual basis since 1917, South Africa simply ceased doing do since 1996.

4. Higher mark-ups in South Africa

The objective of this section is to explore the *intensity* of competition in South African manufacturing industry. We find consistent evidence of pricing power in South African industry that is greater than international comparators, and which is non-declining over time. In this our results are consistent with those reported in Fedderke, Kularatne and Mariotti (2007). Results prove to be robust across:

- Three distinct data sets, covering both industry level data as well as firm-level evidence.
- Two proxies of the Lerner index, given either by the differential between value added and the total wage bill as a proportion of output, or the difference between output and both wage and capital costs as a proportion of output.
- Alternative measures of firm profitability.
- The measure of mark-up of price over marginal cost of production as suggested by section 3.
- The level of aggregation for industry, or firm size.

4.1. The Industry-level (UNIDO) panel data for South Africa

We compute price-cost margins as given by equation (2), while real labor productivity growth is measured as the growth rate of real local currency value added per worker.

Table 3 presents the measures of competition and productivity for each manufacturing industry in South Africa. Due to data availability the price-cost margins we compute differ in two major respects from the Lerner index traditionally used to gauge the degree of competition: the fact that we use average instead of marginal costs, and that we do not take into account the payment to physical capital.[3]

INSERT TABLE 3 ABOUT HERE.

[3] As outlined in section 3., an approach deriving from Hall (1990) proposes a more structured way of measuring markups that is based on Solow residuals. In the present section we favor our measure because

The price-cost margins of Table 3 suggest that there is no significant time variation in the magnitude of the computed mark-up for South African manufacturing industries.

4.2. Firm-level (Worldscope) evidence from publicly listed companies

In order to explore the degree of competition in South Africa we analyze firm-level data corresponding to listed firms in 60 countries in the period 1980-2004. We investigate a number of indicators of profitability across industries and over time. In order to make the analysis robust to influential outliers we truncate all the variables at the 5% level and report the median.

Results are reported in Table 4 through 6.

INSERT TABLE 4, 5 AND 6 ABOUT HERE.

While listed firms in South Africa exhibit around 50% higher profitability when this is measured with Net Income/Sales, Net Income/Assets, and Net Income Equity, their Gross-Margin, Market to Book Ratio, and Price-Earnings Ratios are markedly lower - see the results of Table 4. These patterns do not show systematic variation in time - see the results of Table 5. These differences are in general statistically significant and robust to controlling for total and per capita GDP.

In Table 6 we report separately the median net income over sales ratio for those firms that have a size (based on sales) above and below the median within each industry-country-year cluster. In most sectors there is no significant difference between large and small firms either in South Africa or in the world as a whole - see the results reported in Table 6. There is thus no evidence that large firms in South Africa are relatively more profitable than small ones, at least in the corporate sector: though there is some evidence that in the most recent period large firms have switched from being less (10% lower), to more (50% higher) profitable than small firms - see Table 6.

INSERT TABLE 7 ABOUT HERE.

Finally, we compare the aggregate industry price-cost margins in the manufacturing sector, as computed for the UNESCO industry data base with that of the listed firms in the Worldscope data set. Price-cost margin is defined as value added over output for the industry aggregates and as operating income over sales for listed firms. Results are reported in Table 7. The ratio between the margins for listed firms and all firms is about twice as large in South Africa as in the world as a whole. The difference is observed across virtually all the sectors, although is especially large in Tobacco, Furniture and Electric Machinery.

Solow residuals are a noisy measure of markups (capturing all errors in the measurement of labor and capital), but primarily because the measure cannot be readily computed for a large number of countries, firms, industries, and years. Indeed, in the UNIDO database we do not have sufficient investment data for South African industries to be able to compute the capital stock.

4.3. Industry-level panel data results from the TIPS database

In this section we explore both average manufacturing industry mark-ups, as well as industry level mark-ups in terms of the methodology outlined by section 3.[4] For the average manufacturing sector mark-up we employ the pooled mean group dynamic heterogeneous panel estimation methodology of Pesaran, Shin and Smith (1999),[5] thus controlling for both industry effects and dynamic adjustment to equilibrium over time. For individual sectors, estimation is by means of the cointegration-consistent ARDL methodology of section 8.0.2..

In Table 8 we report the PMGE results for the manufacturing sectors given by the specification:

$$NSR_{it} = \gamma_{0i} + \gamma_1 \left\{ \alpha_{it} \cdot \left[\Delta \left(w + l \right)_{it} - \Delta \left(r + k \right)_{it} \right] \right\} + \varepsilon_{it} \tag{6}$$

with α_{it} denoting the share of labour in value-added of sector i, $\Delta (w + l)_{it}$ the log change in nominal labour cost for sector i, $\Delta (r + k)_{it}$ the log change in total capital stock for sector i, and NSR_{it} the nominal Solow residual. γ_1 now measures $(\mu - 1)$, where $\mu = P/MC$ is the mark-up.[6]

INSERT TABLE 8 ABOUT HERE.

Results are for the average manufacturing sector mark-up, both over the full sample period, as well as rolling decade-long sub-periods, estimated from the TIPS panel data set. Estimations indicate the presence of an aggregate mark-up for the manufacturing sector over the full sample period of 54%. The error-correction term (the ϕ-parameter), indicates that adjustment to the long-run equilibrium is rapid. The Hausman test statistic accepts the inference of an homogenous mark-up across all manufacturing sectors for the long run specification.

The declining trend in the aggregate manufacturing sector mark-up reported by Edwards and Van De Winkel (2005) does not prove to be robust in our estimates - and appears to be driven largely by the relatively low estimate that emerges for the 1991-2000 sub-sample period. Both prior, and subsequent sample periods report higher mark-ups, suggesting that evidence of declining pricing power in the South African economy is not robust. More plausible is that the evidence is of a stable and non-declining level of pricing power, consistent with the firm-level evidence reported in section 4.2.

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[4] We also computed the magnitude of the mark-up. Rearrangement of equation (14) gives:

$$\mu - 1 = \frac{\Delta(p+q) - \alpha\Delta(w+l) - (1-\alpha)\Delta(r+k)}{\alpha[\Delta(w+l) - (r+k)]} \tag{5}$$

allowing for ready computation of the mark-up. Given the noise, and other systematic components of the Solow residual, the series requires smoothing. We employed both moving average and Hodrick-Prescott filter smoothing, and split the full sample period into several overlapping ten-year sub-periods and calculate the average computed mark-up for each sub-period as a moving average. The general trend structure to emerge is broadly consistent with that reported for the estimated results, though they prove subject to greater volatility.

[5] See also the discussion in Fedderke (2004). The Estimation Methodology Appendix (section 8.) provides the detail.

[6] See the discussion in section 7. for the derivation of this specification.

INSERT TABLE 9 ABOUT HERE.

For the sectoral evidence, we note that regressors are almost without exception stationary. Table 9 reports relevant ADF test statistics. ARDL remains an appropriate estimation strategy (with efficiency gains over OLS in the presence of dynamics). In Table 10 we report the individually estimated three digit manufacturing sector mark-up estimates obtained from the PSS ARDL cointegration estimations.[7] Again, estimated mark-ups are reported both for the full sample period, as well as for rolling decade-long sub-periods.

INSERT TABLE 10 ABOUT HERE.

The mark-up is consistently statistically significant across all 3-digit manufacturing sectors.[8] Consistent with the aggregate evidence for the average mark-up in the manufacturing sector as a whole, the evidence suggests that mark-ups in manufacturing industry have increased rather than decreased toward the end of the sample period. In Table 11 we summarize by placing sectors into six main categories: high mark-ups that either decline, rise or stay the same into the last within-sample decade (1995-2004); or low mark-ups that either decline, rise or stay the same into the last within-sample decade (1995-2004). We find that for 16 sectors the mark-up increases, for seven it declines, while for four sectors there is little change.

INSERT TABLE 11 ABOUT HERE.

As a final consistency check of our results, given the potential for high volatility in the Solow residual, we computed the alternative measure of pricing power provided by the proxy for the Lerner index given by equation (3). Results are reported by three digit manufacturing sector, and by ten year sample sub-period in Table 12. Consistent with the remainder of the results reported thus far, the results consistently indicate a non-declining pricing power in South African manufacturing industry.[9]

INSERT TABLE 12 ABOUT HERE.

5. Market competition and productivity growth in SA

The objective of this section is to explore the *impact* of the intensity of competition on productivity growth in the South African manufacturing sector. We find that pricing power in South African industry is associated with lower productivity growth in South African manufacturing. Results prove to be robust across:

- Three distinct data sets, covering both industry level data as well as firm-level evidence.
- Two proxies of the Lerner index, given either by the differential between value added and the total wage bill as a proportion of output, or the difference between output and both wage and capital costs as a proportion of output.

[7] For details, see the explanation contained in the estimation methodology appendix, section 8.0.2..

[8] Standard errors and diagnostics for the full sample period estimation are consistently statistically sound with the exception of the Glass and Glass Products sector. Full results available from the authors on request.

[9] The sole exceptions are Printing, Plastics and Other transport equipment.

5.1. Competition and growth, using the industry-level (UNIDO) and firm-level (Worldscope) panel data

We deal with the difference between average and marginal costs by estimating the relationship between growth and margins using the time variation in margins within each industry or sector. We estimate equation (1) such that:

$$Pgrowth_{it} = \alpha + \beta PCM1_{it-1} + I_i + I_t + \varepsilon_{it},$$

such that $Pgrowth_{it}$ is given by average labor productivity growth in sector i at time t, PCM_{it-1} is the *lagged* average mark-up in sector i, as computed in equation (2).

We present results for the world as a whole as well as South Africa specifically. In the world regressions we add country fixed effects. The observations are not assumed to be independent within each country and year, so that we compute significance levels using errors that are clustered at the country and year level. If competition spurs innovation and growth, we would expect a negative coefficient for PCM.

This specification allows us to shield the results from either industry or firm characteristics that may affect measured price-cost margins but that are nonetheless not related to the degree of competition it faces. One such characteristic is the fact that the divergence between marginal and average costs may differ across industries due to differential economies of scale. Another possibility is that the exclusion of financial costs from the PCM measure may have a differential effect across industries sorted on capital intensity. If for some reason labor productivity growth is correlated with these characteristics, estimation using cross-industry data will suffer from omitted variable bias. However, as long as these characteristics do not vary systematically in time, the approach we propose solves the issue.

We also run firm-level regressions not controlling for firm fixed effects but only for industry fixed effects. In this case part of the variation comes from the difference of PCMs across firms and not only in time within firms.

Tables 13 and 14 present the basic results using industry and firm-level data, respectively. In the first and fourth columns of Table 13 we use aggregates for the entire manufacturing sector. In the rest of the columns we use the variation of the 27 different manufacturing industries. Columns 1 through 3 correspond to the estimation over the data for the full set of 115 countries in the UNIDO data set, while the rest use data for South Africa alone.

INSERT TABLES 13 AND 14 ABOUT HERE.

The results strongly suggest that there is a positive effect of product market competition on productivity growth. All the coefficients for margins are negative and statistically significant at conventional values. The economic magnitude of the effect is also very large. A 10% increase from the mean margin of 0.24 on the 115-country sample implies a decrease in productivity growth of 2.4% per year. For the typical industry this would mean reducing growth from 2.6% a year to a mere 0.2%. A similar change on margins in South Africa is associated with a decline of 1.6% per year, which would reduce the median growth from 1% to -0.6%.

Figures 1 and 2 depict graphically the relationship between margins and productivity found in the aggregate and the industry-level data. It is clear from these that the relationship is not driven by influential outliers but is a robust pattern in the data.

INSERT FIGURES 1 AND 2 ABOUT HERE.

Table 14 presents results with firm (columns 1 through 3 and 7 through 9) and industry fixed effects (the rest of the columns) for a sample of 56 countries (left panel) and South Africa alone (right panel). As in the industry data, the coefficient for the PCM term is in all cases negative and significant in statistical terms, both on average across countries and in South Africa in particular. The economic magnitude of the effect is somewhat larger that what we found in the industry data. Here a 10% increase in margins (over the mean of 0.11 for the 56-country sample and 0.12 for South Africa) is associated with a decrease in productivity growth of 3.3% in the 56-country sample and 2.4% in South Africa. Again, these magnitudes are substantial since the median productivity growth rate is 1.2% and 1.8% in each sample.

The results are virtually unchanged when we include financial costs into our cost measure (see columns 2, 5, 8, and 11).

Interestingly, the relationship between margins and productivity although negative on average, is U-shaped. These results are in line with Aghion et al (2005)´s theoretical predictions and extend their results for British publicly-listed firms.

INSERT TABLE 15 ABOUT HERE.

Even if we use lagged margins and control for industry and year fixed effects, the results above may still be due to spurious correlation. In particular, our computed margins may be caused to some extent by shocks to productivity growth. We attempt to control for this endogeneity by instrumenting margins with industry import penetration, which is assumed to affect productivity only through their effect on product market competition. Import penetration is computed for each industry, country, year observation as total imports over output. The raw data are taken from Mayer and Zignano (2005). Table 15 shows that import penetration is not a particularly good instrument for margins in the sense that its correlation with margins is typically not significantly negative.[10] Not surprisingly, then, the second-stage IV estimates of the effect of margins on productivity growth are also typically not significantly negative. However, where import penetration appears to be a good instrument (firm-level, all countries sample in column three) the IV estimate of the effect of margins - although smaller than before - enters negatively and statistically significantly into the growth regression. This suggests that at least part of the relation between margins and growth is caused by margins affecting growth and not the other way around.

We experimented with some other instruments such as the opening of the economy to trade, the degree of tradeability of the industry, and the level of tariffs. In each case the results were similar to those reported in Table 15. The instruments are not particularly good, and the IV estimate of the coefficient of margins on growth typically enters negatively but not significantly so.

[10]Though note that Fedderke et al (2007) demonstrate that there does exist a negative impact of import penetration ratios on mark-ups in South African manufacturing.

5.2. *Competition, growth and employment using the industry-level panel data from the TIPS database*

As a final exploration of the impact of price-cost margins on productivity growth, we employ the South African data base provided by TIPS. One advantage of the data base lies in the long sample time-frame for which it is available, allowing us to test for the robustness of results in the presence of both dynamics and industry heterogeneity. In addition, the more comprehensive data series available in the data base allow for a more accurate computation of price-cost margins.

Given the discussion of section 3.1., we estimate equation (1) such that:

$$Pgrowth_{it} = \alpha + \beta PCM2_{it-1} + I_i + I_t + \varepsilon_{it}$$

where $Pgrowth_{it-1}$ is the Solow residual in sector i at time t, $PCM2$ is the proxy for the Lerner index as given by equation (3), and I_i, I_t stand for industry and time fixed effects. As discussed in the preceding section, inclusion of industry and time fixed effects again allows us to shield results from either industry characteristics that may affect measured price-cost margins but that are nonetheless not related to the degree of competition in the sector.

INSERT TABLE 16 ABOUT HERE.

Table 16 reports results for the manufacturing industry average over the full 1970-2004 sample period, controlling either for industry fixed effects (columns 1 and 3) or both industry and time fixed effects (columns 2 and 4), and allowing for either a linear (columns 1 and 2) or non-linear (columns 3 and 4) impact of our Lerner index proxy on productivity growth. Results consistently confirm a negative impact of the price-cost margin on productivity growth, regardless of the presence of time effects, or the non-linearity in the price-cost margin - though statistical significance dissipates in the presence of both time dummies and controlling for the non-linearity in the measure for pricing power.

In the estimation results reported thus far we have controlled for group heterogeneity only by means of group and time fixed effects - ignoring the possibility of group heterogeneity in parameter space. Yet failure to control for group heterogeneity results in bias and inconsistency of parameter estimates - see Pesaran, Shin and Smith (1999). In the present set of estimations we therefore also allow for the possibility of heterogeneity across industry sectors in parameter estimates. Details of the dynamic heterogeneous panel (pooled mean group) estimator employed is given in Appendix 8.0.1.. Results for the full sample period are reported in columns (5) through (8) of Table 16. We estimate controlling both for linear (columns 5 and 7) and non-linear (columns 6 and 8) impacts of pricing power on productivity growth. In addition, since there is some doubt on data quality for a number of the industrial sectors,[11] we estimate both for the full industrial sample with 28 sectors (columns 5 and 6), and for a sub-set of 22 sectors which excludes sectors with doubtful data quality. For the PMGE estimates, the Hausman test statistic confirms the inference of an homogenous mark-up across all manufacturing sectors for the long run specification, though short

[11] Particularly Tobacco, Rubber, Electrical machinery, Televisions & other communications equipment, Professional equipment and Other manufacturing.

run dynamics vary across the industrial sectors. Moreover, the error-correction term (the ECM-parameter), indicates that adjustment to the long-run equilibrium is rapid. Results are thus statistically coherent.

Again, PMGE estimations confirm the presence of a negative impact of the measure of the price-cost margin on productivity growth, for both the full industrial sample as well as the sub-sample of industries, and irrespective of whether the non-linearity in the price-cost margin is controlled for.

For the full 1970-2004 sample period for South Africa, we thus consistently and robustly find that the proxy for the Lerner index of equation (3) is negatively associated with productivity growth as measured by TFP growth. Moreover, the impact is both statistically and economically significant. An estimated coefficient of -0.10 for the price cost-margin means that on average across all manufacturing sectors, a 0.1 unit increase in the Lerner index proxy, is associated with a 1% reduction in the real growth rate as measured by growth in total factor productivity.

Evidence from the detailed South African specific data set is thus consistent with the international data sets considered by in the preceding section. The only divergence is with respect to the inverted-U relationship which finds no support from the full sample period results presented in Table 16. Neither the inverted-U specification, nor the statistical significance of the non-linearity are supported by the results.

To control for the potential endogeneity arising from the fact that our computed margins may be caused to some extent by shocks to productivity growth, we instrument on a range of trade-related measures obtained from Edwards (2005). Specifically, we employ computed effective rates of protection, scheduled tariff rates, export taxes and a measure of the anti-export bias of trade protection, in each instance by SIC 3-digit manufacturing sector, as instruments. Since these series are available only for the 1988-2003 period, the size of the South African panel is correspondingly reduced in dimension.

In Table 17 we report results that replicate those of Table 16, to confirm the robustness of our findings for the 1988-2003 sub-sample. Within group estimation results are reported in columns 1 through 4, and PMGE results in columns 5 through 8.[12] Results over the most recent period confirm the negative impact of the price-cost margin measure on productivity growth - indeed the magnitude of the impact approximately doubles in magnitude. In addition, the inverted-U relationship that was not able to be isolated for the full sample period, is now consistently confirmed by our estimations, with strong statistical significance. Results are robust to controlling for industry and time effects, and further strengthen once we control for the possibility of parameter heterogeneity across industrial sectors by means of the PMG estimator.

INSERT TABLE 17 ABOUT HERE.

Finally, estimation results for the 1988-2003 sub-sample, in which the Lerner index proxy is instrumented on the tade protection measures detailed above, are reported in Table 18.

INSERT TABLE 18 ABOUT HERE.

[12] Note that for the PMG estimator, diagnostics again confirm long run homogeneity and adjustment to long run equilibrium.

As for the previous section, our instruments are of limited quality. While demonstrating a low correlation with our measure of productivity growth, only scheduled tariff rates and export taxes show statistically significant partial correlations with the Lerner index measure, and the absolute magnitude of the correlation of all of the trade protection measures with the price-cost margin measure is low. Unsurprisingly, therefore, under within group estimation employing the instrumented measure of pricing power, the impact of the price-cost margin is generally negative, but statistically insignificant - see columns 1 through 4 of Table 18. On the other hand, where we control for industry heterogeneity by means of the PMG estimator, the negative impact of the instrumented price cost margin on productivity growth is not only statistically significant, but strengthens in economic magnitude relative to that found for the estimates that do not control for endogeneity. Finally, for the PMG estimations, the inverted-U relationship finds further statistical confirmation.

Despite the fact that we have available only relatively por instruments, therefore, these results suggest that the relation between price-cost margins and growth is caused by margins affecting growth, not the other way around.[13]

5.3. Labour flexibility

As a final empirical contribution in this paper, we explore the link between industry mark-ups and the *flexibility* of labour markets.

The theory relating productivity residuals to the mark-up is based on a first-order Taylor approximation (in logs) of the primal and dual Solow residuals. This is appropriate when estimating the steady-state mark-up. However it does not allow for the investigation of cyclical effects which are second-order. An adaptation of a result derived by Oliviera Martins and Scarpetta (1999) shows us that under the condition of a two-input production function (we ignore intermediate inputs) and with Hicks neutrality in technical progress, the equation for the variable mark-up is given by:

$$\begin{aligned} \Delta \log \mu &= (\Delta q + \Delta p) - \Delta w + \left(\frac{1}{\sigma} - 1\right)\overline{\mu}(1-\alpha)\Delta k \\ &\quad - \frac{1}{\sigma}\frac{L}{L-\overline{L}}\overline{\mu}(1-\alpha)\Delta l - \overline{\mu}\alpha\Delta l \end{aligned} \tag{7}$$

where σ denotes the elasticity of substitution between capital and labour, $\overline{\mu}$ the steady-state mark-up and $\overline{L}$ the amount of labour devoted to fixed costs.

The $\frac{L}{L-\overline{L}}$ term, representing the ratio of labour employed to the proportion of total labour employed which is variable, can be interpreted as an indicator of the degree of downward

[13] We also explored the impact of competitive pressure on employment by means of:

$$L_{it} = \alpha + \beta PCM2_{it} + I_i + \varepsilon_{it}$$

where L_{it} denotes employment in sector i at time t, and $PCM2$ is the proxy for the Lerner index as given by equation (3). We find a statistically significant though small negative impact of the price-cost margin on employment both for manufacturing industry as a whole, and for individual industries. Results available from the authors on request.

rigidities in adjustments of labour time. The feasible range is from unity (no rigidity) to infinity (complete rigidity).

Rearrangement of (7) provides the following expression:

$$\begin{aligned} LF &= \frac{1}{1-\alpha}\left(\frac{\Delta \log \mu - ((\Delta q + \Delta p) - \Delta w)}{\overline{\mu}} - \alpha \Delta l\right) \\ &= \left(\frac{1}{\sigma} - 1\right)\Delta k - \frac{1}{\sigma}\frac{L}{L-\overline{L}}\Delta l \end{aligned} \tag{8}$$

which leads to the specification that is estimated and discussed below.

In order to econometrically investigate the relationship between the mark-up and labour adjustment, equation (8) suggests a specification of the form:

$$\begin{aligned} y_{it} &= \beta_{0i} + \beta_1 \Delta k_{it} + \beta_2 \Delta l_{it} + \varepsilon_{it} \\ \textit{where } y_{it} &= \frac{1}{1-\alpha_{it}}\left(\frac{\Delta \log \mu_{it} - ((\Delta q + \Delta p)_{it} - \Delta w_{it})}{\overline{\mu_i}} - \alpha_{it}\Delta l_{it}\right) \end{aligned} \tag{9}$$

under the notation standard to this paper.

Two of the required variables are not available directly from the original panel data set: the steady-state mark-up and the growth rate of the mark-up. We use the mark-up that was estimated over the full sample period under the Hall-Roeger methodology in section 4.3. as the steady-state mark-up for each sector, and use the smoothed computed mark-up series to calculate the growth rate of the mark-up for each sector.

A simple manipulation of coefficient estimates allows us to obtain an estimate of the labour flexibility coefficient, $\frac{L}{L-\overline{L}}$. We use $\widehat{\beta_1}$ to obtain an estimate of the elasticity of substitution between capital and labour as in equation (10). Then we use $\widehat{\beta_2}$ along with the estimate of the elasticity of substitution to obtain an estimate of the labour adjustment coefficient as in equation (11).

$$\widehat{\beta_1} = \left(\frac{1}{\widehat{\sigma}} - 1\right) \Rightarrow \widehat{\sigma} = \frac{1}{\widehat{\beta_1} + 1} \tag{10}$$

$$\widehat{\beta_2} = \frac{1}{\widehat{\sigma}}\frac{\widehat{L}}{L-\overline{L}} \Rightarrow \frac{\widehat{L}}{L-\overline{L}} = \widehat{\sigma}\widehat{\beta_2} = \frac{\widehat{\beta_2}}{\widehat{\beta_1}+1} \tag{11}$$

Under circumstances in which $\widehat{\beta_1}$ is not significantly different from zero, we infer an elasticity of substitution of unity in the calculation of the labour adjustment coefficient as this follows directly from $\widehat{\beta_1} = 0$. Note that when we calculate the labour adjustment coefficient, the "correct" elasticity of substitution is defined to be $\widehat{\sigma}$ as in (11) if $\widehat{\beta_1}$ is significantly different from zero, and else as unity.

Recall that $\frac{L}{L-\overline{L}} \to 1$ implies perfect flexibility of the labour market, while $\frac{L}{L-\overline{L}} \to \infty$ implies inflexibility.

INSERT TABLE 18 ABOUT HERE.

We report the PMGE results for the manufacturing sector in Table 18. The error-correction term, the ϕ-parameter, indicates that adjustment to the long-run equilibrium is rapid, and increasing with an increase in the adopted lag structure. The Hausman test accepts the inference of an homogenous labour adjustment coefficient across sectors for the long run.

Results indicate an estimate of an aggregate labour adjustment coefficient for the manufacturing sector over the full sample period of between 2.84 and 3.43, depending on which lag structure is adopted. This would suggest that of the total labour employed in manufacturing in South Africa, two-thirds is effectively allocated to fixed costs and only one-third is attributable to variable costs.

In order to investigate the trend of the aggregate manufacturing sector labour adjustment coefficient over time, we run the estimation of our specification on fifteen-year sub-periods and roll these through the full sample period year-by-year. The results are reported in Table 19. The general pattern that emerges is a decreasing labour adjustment coefficient through the first half of the sample followed by an increasing labour flexibility coefficient in the second half of the sample.

INSERT TABLE 19 ABOUT HERE.

The inference is thus of increasing flexibility in the adjustment of labour time in the first half of the sample, which is substantially reversed in the second half of the sample period.

6. Conclusion

In this paper we have explored three alternative panel data sets to first assess the degree of product market competition in South African manufacturing industries, and then to estimate the effect of product market competition on growth. Consistently across the three data set, we found that: (i) mark-ups remain significantly higher in SA industries than in corresponding industries worldwide; (ii) that a reduction in mark-ups (that is, an increase in product market competition) should have large positive effects on productivity growth in South Africa.

The analysis in this paper can be extended in several interesting directions. A first extension is to push further on the search for good instruments for product market competition. A second extension is to look for entry data and perform the same kind of comparative analysis of entry measures and regression analysis of entry and growth as we did for mark-ups in this paper. A third extension would be to explore the link between trade liberalization and its impact on competitive pressure, hence productivity growth in more detail. These and other extensions of the paper await further research.

7. Estimation of Mark-ups Methodology Appendix

Under the assumption of constant returns to scale, the primal computation of the Solow Residual (SR), or growth in Total Factor Productivity (TFP), is related to the mark-up of prices over marginal cost. Hall (1990) demonstrates that:

$$\begin{aligned} TFP &= SR = \Delta q - \alpha \cdot \Delta l - (1-\alpha) \cdot \Delta k \\ &= (\mu - 1) \cdot \alpha \cdot (\Delta l - \Delta k) + \theta \end{aligned} \tag{12}$$

where $\mu = P/MC$, with P denoting price, and MC denoting marginal cost. Under perfect competition $\mu = 1$, while imperfectly competitive markets allow $\mu > 1$. Δ denotes the difference operator, lower case denotes the natural log transform, q, l, and k denote real value-added, labour, and capital inputs, α is the labour share in value-added, and $\theta = \dot{A}/A$ denotes exogenous (Hicks-neutral) technological progress, where is A is the technology parameter.

Estimation of equation (12) faces the difficulty that the explanatory variables $(\Delta l - \Delta k)$ will themselves be correlated with the productivity shocks θ, and hence result in bias and inconsistency in estimates of μ. One solution is to instrument.[14] Unfortunately instrumentation for the US has led to the estimation of mark-ups that are generally implausibly high.

An alternative approach to avoid the endogeneity bias and instrumentation problems has been suggested by Roeger (1995). By computing the dual of the Solow Residual (DSR), we can again obtain a relation of the price-based productivity measure to the mark-up:

$$\begin{aligned} DSR &= \alpha \cdot \Delta w - (1-\alpha) \cdot \Delta r - \Delta p \\ &= (\mu - 1) \cdot \alpha \cdot (\Delta w - \Delta r) + \theta \end{aligned} \tag{13}$$

with w, r denoting the natural logs of the wage rate and rental price of capital respectively. While equation (13) is subject to the same endogeneity problems and hence instrumentation problems as equation (12), Roeger's insight was that subtraction of equation (13) from equation (12) would give us the *nominal* Solow residual (NSR), given by:

$$\begin{aligned} NSR &= \Delta(p+q) - \alpha \cdot \Delta(w+l) - (1-\alpha) \cdot \Delta(r+k) \\ &= (\mu - 1) \cdot \alpha \cdot [\Delta(w+l) - \Delta(r+k)] \end{aligned} \tag{14}$$

in which the productivity shocks (θ) have cancelled out, removing the endogeneity problem, and hence the need for instrumentation. The mark-up is now accessible either to simple OLS estimation, or to direct computation.

Extensions of the framework for identifying the extent of mark-up pricing provided by equation (14), include relaxing the assumption of constant returns to scale, incorporating the impact of business cycles, import and export competition, market structure, and the

[14] This in turn raises the requirement that the instruments are correlated with the factor inputs, but not technological change and hence the error term (θ). In the case of applications to the US, instruments employed have been pure aggregate demand shifters. In particular, the variables employed have been aggregate real GDP, military expenditure, the world oil price, and the political party of the president. See for instance Hall (1990) and the discussion in Oliveira Martins and Scarpetta (1999).

use of alternative measures of output. Any estimate of mark-up that follows from Solow Residuals should be interpreted as lower-bound values if increasing returns to scale are present.[15] Since tariff and other restrictions clearly carry implications for the degree of international competition to which domestic industry is exposed, and hence the magnitude of the feasible mark-up that domestic industry can maintain, import and export competition is relevant to the pricing power of industry.[16] Market structure similarly carries implications for competitive pressure and hence pricing behaviour in markets.[17] Finally, both cyclical fluctuations and the use of gross output accounting for intermediate inputs, or value added in the absence of intermediate inputs carries implications for the magnitude of the mark-up.[18]

8. Estimation Methodology Appendix

8.0.1. The Panel Estimator: Pooled Mean Group Estimator

Consider the unrestricted error correction ARDL(p, q) representation:

$$\Delta y_{it} = \phi_i y_{i,t-1} + \boldsymbol{\beta}_i' \mathbf{x}_{i,t-1} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \boldsymbol{\delta}_{ij}' \Delta \mathbf{x}_{i,t-j} + \mu_i + \varepsilon_{it}, \tag{15}$$

where $i = 1, 2, ..., N$, $t = 1, 2, ..., T$, denote the cross section units and time periods respectively. Here y_{it} is a scalar dependent variable, $\mathbf{x}_{it}$ $(k \times 1)$ a vector of (weakly exogenous) regressors for group i, and μ_i represents fixed effects. Allow the disturbances ε_{it}'s to be independently distributed across i and t, with zero means and variances $\sigma_i^2 > 0$, and assume that $\phi_i < 0$ for all i. Then there exists a long-run relationship between y_{it} and $\mathbf{x}_{it}$:

$$y_{it} = \boldsymbol{\theta}_i' \mathbf{x}_{it} + \eta_{it}, \; i = 1, 2, ..., N, \; t = 1, 2, ..., T, \tag{16}$$

where $\boldsymbol{\theta}_i = -\boldsymbol{\beta}_i' / \phi_i$ is the $k \times 1$ vector of the long-run coefficients, and η_{it}'s are stationary with possibly non-zero means (including fixed effects). This allows equation (15) to be written as:

$$\Delta y_{it} = \phi_i \eta_{i,t-1} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \boldsymbol{\delta}_{ij}' \Delta \mathbf{x}_{i,t-j} + \mu_i + \varepsilon_{it}, \tag{17}$$

where $\eta_{i,t-1}$ is the error correction term given by equation (16), and thus ϕ_i is the error correction coefficient measuring the speed of adjustment towards the long-run equilibrium.

[15] Specifically, one can show that where the assumption of constant returns to scale is dropped, equation (14) is actually:

$$NSR = \left(\frac{\mu}{\lambda} - 1 \right) \cdot \alpha \cdot [\Delta (w + l) - \Delta (r + k)]$$

where $\lambda > 1$ denotes increasing returns to scale. Effectively equation (14) assumes $\lambda = 1$. See Oliviera Martins and Scarpetta (1999).

[16] See the discussion in Hakura (1998), and the extensions and empirical application in Fedderke, Kularatne and Mariotti (2007).

[17] See the discussion in Fedderke, Kularatne and Mariotti (2007).

[18] See Oliviera Martins and Scarpetta (1999).

This general framework allows the formulation of the PMGE, which allows the intercepts, short-run coefficients and error variances to differ freely across groups, but the long-run coefficients to be homogenous; i.e. $\boldsymbol{\theta}_i = \boldsymbol{\theta}\ \forall\ i$. Group-specific short-run coefficients and the common long-run coefficients are computed by the pooled maximum likelihood estimation. Denoting these estimators by $\tilde{\phi}_i$, $\tilde{\boldsymbol{\beta}}_i$, $\tilde{\lambda}_{ij}$, $\tilde{\boldsymbol{\delta}}_{ij}$ and $\tilde{\boldsymbol{\theta}}$, we obtain the PMG estimators by $\hat{\phi}_{PMG} = \frac{\sum_{i=1}^{N}\tilde{\phi}_i}{N}$, $\hat{\boldsymbol{\beta}}_{PMG} = \frac{\sum_{i=1}^{N}\tilde{\boldsymbol{\beta}}_i}{N}$, $\hat{\lambda}_{jPMG} = \frac{\sum_{i=1}^{N}\tilde{\lambda}_{ij}}{N}$, $j = 1, ..., p-1$, and $\hat{\boldsymbol{\delta}}_{jPMG} = \frac{\sum_{i=1}^{N}\tilde{\boldsymbol{\delta}}_{ij}}{N}$, $j = 0, ..., q-1$, $\hat{\boldsymbol{\theta}}_{PMG} = \tilde{\boldsymbol{\theta}}$.

PMGE provides an intermediate case between the dynamic fixed effects (DFE) estimator which imposes the homogeneity assumption for all parameters except for the fixed effects, and the mean group estimator (MGE) proposed by Pesaran and Smith (1995), which allows for heterogeneity of all parameters. It exploits the statistical power offered by the panel through long-run homogeneity, while still admitting short-run heterogeneity.

The crucial question is whether the assumption of long-run homogeneity is justified, given the threat of inefficiency and inconsistency noted by Pesaran and Smith (1995). We employ a Hausman (1978) test (hereafter h test) on the difference between MG and PMG estimates of long-run coefficients to test for long run heterogeneity.[19] Note that as long as the homogeneity Hausman test is passed in our estimations, we report only PMG estimation results.[20]

Finally, it is worth pointing out that a crucial advantage of the estimation approach of the present paper, is that the dynamics of adjustment in the mark-up are explicitly modelled, while recognizing the presence of a long run equilibrium relationship underlying the dynamics. Thus the justification for the use of the PMG estimator is that it is consistent both with the underlying theory of a homogenous long-run mark-up of price over marginal cost relationship and the possibly heterogeneous dynamic time series nature of the data. As long as sector-homogeneity is assured, the PMGE offers efficiency gains over the MGE, while granting the possibility of dynamic heterogeneity across sectors unlike the DFE estimator. In the presence of long run homogeneity, therefore, our preference is for the use of the PMGE.

8.0.2. The ARDL Approach to Cointegration

Pesaran, Shin and Smith (1996, 2001) (hereafter PSS) advocate the use of autoregressive distributed lag models for the estimation of long run relations. The PSS bounds testing approach proceeds by estimating the error correction model given by:

$$y_t = \alpha_0 + \sum_{i=1}^{p}\beta_i \Delta y_{t-i} + \sum_{j=1}^{k}\sum_{i=1}^{p}\gamma_{ji}\Delta x_{j,t-i} + \left(\delta_1 y_{t-1} + \sum_{j=1}^{k}\delta_{j+1}x_j\right) \tag{18}$$

Tests of significance of joint zero restrictions on the $\delta' s$ of the error correction model establish the presence of a long run relationship, and its directionality. Confirmation of a unique long

[19] An alternative is offered by Log-Likelihood Ratio tests. However, the finite sample performance of such tests are generally unknown and thus unreliable. We therefore employ the h-test instead.

[20] The authors thank Yongcheol Shin for the provision of the appropriate GAUSS code for estimation purposes.

run relationship allows for estimation in a two step strategy, selecting the ARDL orders on the basis of the Akaike Information criterion (AIC), then estimating the long and short run coefficients on the basis of the selected model. Estimation of the long run relationship $y_t = \zeta + \eta t + \theta x_t + \nu_t$ can be shown to be feasible on the basis of the "Bewley regression:"

$$y_t = \zeta + \eta t + \sum_{i=1}^{k} \theta_i x_i + \sum_{j=0}^{p-1} \gamma_j \Delta y_{t-j} + \sum_{m=0}^{q-1} \delta_m \Delta x_{t-m} \tag{19}$$

by the instrumental variables method, where 1, t, $\sum_{i=1}^{k} x_i$, $\sum_{j=0}^{p-1} \Delta y_{t-j}$, $\sum_{m=0}^{q-1} \Delta x_{t-m}$, serve as instruments,.[21]

[21] The methodology outlined presumes that the x_i and ϵ are uncorrelated. Where they are correlated, the methodology remains valid, but the "Bewley regression" requires augmentation.

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Table 1: Three Digit Manufacturing Sectors Included in Study	
Food	Rubber products
Beverages	Glass & glass products
Tobacco	Non-metallic minerals
Textiles	Basic iron & steel
Wearing apparel	Basic non-ferrous metals
Leather & leather products	Metal products excluding machinery
Footwear	Machinery & equipment
Wood & wood products	Electrical machinery
Paper & paper products	Television & other communications equipment
Printing, publishing & recorded media	Professional equipment
Coke & refined petroleum products	Motor vehicles, parts & accessories
Basic chemicals	Other transport equipment
Other chemicals	Furniture
Plastic products	Other manufacturing industry

Table 2: Standard deviations of computed mark-ups across subperiods

	1971-1980	**1975-1984**	**1981-1990**	**1985-1994**	**1991-2000**	**1995-2004**
Food	0.54	0.23	0.14	0.13	1.26#	1.30#
Beverages	5.00	3.70	1.68	1.63	1.00	3.52
Tobacco	10.64	8.31	8.22	14.16	19.92	259.31#
Textiles	1.91	0.21	0.52	0.50	1.37#	2.39#
Wearing apparel	0.18	0.10	0.29	0.27	9.49#	9.67#
Leather & leather products	0.08	0.09	0.10	0.11	1.47#	3.42#
Footwear	0.06	0.04	0.12	0.15	3.40#	3.85#
Wood & wood products	0.67	0.41	0.64	0.62	1.99#	1.95#
Paper & paper products	0.51	0.39	11.34	11.33	4.04	4.30
Printing, publishing & recorded media	0.20	0.09	0.63	0.60	2.20#	2.15#
Coke & refined petroleum	11.47	2.74	7.31	8.39	44.10#	42.85#
Basic chemicals	1.38	0.45	0.41	0.36	2.04#	3.57#
Other chemicals & man-made fibers	0.63	0.28	0.61	0.59	1.78#	8.69#
Rubber products	0.29	0.13	0.23	0.24	2.41#	6555.49#
Plastic products	0.83	0.71	5.01	5.00	1.28	4.00
Glass & glass products	0.16	0.11	0.49	0.49	0.76	7.70#
Non-metallic minerals	0.54	0.29	4.25	4.23	3.71	4.39
Basic iron & steel	1.01	0.22	0.14	0.12	1.44#	6.33#
Basic non-ferrous metals	1.10	0.63	0.97	0.94	13.78#	18.53#
Metal products excluding machinery	0.21	0.14	0.65	1.22	1.19	2.33#
Machinery & equipment	0.69	0.26	0.43	0.41	1.96#	2.10#
Electrical machinery & apparatus	n/a	n/a	n/a	n/a	n/a	n/a
Television, & communications equipment	0.53	0.47	7.79	8.70	9.44	8.53
Professional & scientific equipment	0.96	0.93	0.39	0.91	2.05#	4.76#
Motor vehicles, parts & accessories	0.20	0.17	2.21	2.24	19.30#	20.27#
Other transport equipment	2.39	1.12	1.05	1.35	5.56#	5.76#
Furniture	0.55	0.54	0.31	0.32	1.61#	1.67#
Other manufacturing	1.97	1.94	1.74	1.92	1.89	2.95#

Table 3: South African UNIDO Industry Data: Price-Cost Margins and Labor Productivity Growth

Industry	1976-80		1981-85		1986-90		1991-95		1996-2000	
	PC Margin	Prod Growth	PC Margin	Prod Growth	PC Margin	Prod Growth	PC Margin	Prod Growth	PC Margin	Prod Growth
Beverages	0.359	0.0075	0.364	0.0263	0.373	0.0700	0.377	0.0656	0.361	0.0487
Fabricated metal products	0.222	0.0062	0.211	0.0084	0.212	0.0348	0.216	0.0256	0.215	0.0318
Food products	0.170	-0.0048	0.167	0.0090	0.180	0.0439	0.190	0.0534	0.182	0.0223
Footwear, except rubber or plastic	0.234	0.0210	0.216	0.0104	0.192	0.0341	0.197	-0.0139	0.186	0.0303
Furniture, except metal	0.228	0.0229	0.212	0.0021	0.216	0.0232	0.210	0.0398	0.206	0.0528
Glass and products	0.275	0.0452	0.265	0.0168	0.285	0.0393	0.300	0.0646	0.290	0.0423
Industrial chemicals	0.255	-0.0049	0.231	0.0288	0.255	0.0454	0.250	0.0597	0.255	0.0214
Iron and steel	0.189	0.0372	0.186	0.0267	0.214	0.0577	0.219	0.0345	0.193	0.0047
Leather products	0.204	0.0093	0.197	0.0134	0.180	0.0322	0.189	0.0326	0.159	0.0128
Machinery, electric	0.230	0.0133	0.239	0.0339	0.236	0.0523	0.240	0.0457	0.230	0.0615
Machinery, except electrical	0.233	0.0148	0.226	0.0148	0.223	0.0457	0.235	0.0563	0.209	0.0214
Misc. petroleum and coal products	0.209	0.0388	0.196	-0.0136	0.222	0.0422	0.231	0.0629	0.204	0.0241
Non-ferrous metals	0.198	0.0283	0.188	0.0047	0.200	0.0570	0.198	0.0612	0.182	0.0027
Other chemicals	0.256	0.0174	0.259	0.0265	0.259	0.0454	0.275	0.0489	0.285	0.0401
Other manufactured products	0.266	0.0244	0.244	-0.0005	0.227	0.0024	0.223	0.0271	0.239	0.0487
Other non-metallic mineral products	0.277	0.0306	0.266	0.0172	0.284	0.0561	0.285	0.0339	0.282	0.0334
Paper and products	0.226	0.0229	0.206	0.0156	0.215	0.0697	0.222	0.0591	0.217	0.0107
Petroleum refineries	0.191	0.0289	0.168	-0.0233	0.239	0.0725	0.272	0.0158	0.237	0.0240
Plastic products	0.246	0.0115	0.236	0.0203	0.237	0.0495	0.237	0.0515	0.230	0.0350
Pottery, china, earthenware	0.300	0.0201	0.278	0.0054	0.293	0.0482	0.284	0.0365	0.295	0.0205
Printing and publishing	0.265	0.0187	0.244	0.0047	0.246	0.0470	0.254	0.0668	0.244	0.0513
Professional & scientific equipment	0.269	0.0086	0.266	0.0350	0.268	0.0577	0.257	-0.0041	0.250	0.0433
Rubber products	0.224	0.0327	0.233	0.0168	0.231	0.0257	0.237	0.0741	0.239	0.0203
Textiles	0.213	0.0141	0.204	0.0097	0.211	0.0395	0.225	0.0411	0.202	0.0244
Tobacco	0.396	0.0058	0.426	0.0477	0.464	0.0823	0.478	0.0329	0.419	0.0691
Transport equipment	0.198	0.0156	0.189	0.0193	0.190	0.0430	0.192	0.0932	0.189	0.0678
Wearing apparel, except footwear	0.205	0.0175	0.197	-0.0010	0.182	0.0286	0.206	0.0215	0.207	0.0226
Wood products, except furniture	0.233	0.0298	0.214	-0.0042	0.213	0.0456	0.223	0.0526	0.213	0.0197
Total manufacturing	0.224	0.0198	0.212	0.0155	0.231	0.0437	0.242	0.0449	0.233	0.0445

Table 4: Firm Level (Worldscope) Evidence on Profitability: The Level of Profitability Employing Alternative Measures of Firm Profitability by Three Digit Manufacturing Industry

	Net Income/Sales			Net Income/Assets			Net Income/Equity			Gross Margin			Market to Book Assets			Price/Earnings Ratio		
	ZAF	World	Diff	ZAF	World	Diff	ZAF	World	Diff	ZAF	World	Diff	ZAF	World	Diff	ZAF	World	Diff
APPAREL	0.036	0.032	0.004	0.056	0.037	0.020	0.099	0.090	0.009	0.131	0.288	-0.157	0.84	1.11	-0.27	5.81	9.57	-3.76
AUTOMOTIVE	0.032	0.021	0.011	0.054	0.024	0.029	0.113	0.076	0.037	0.096	0.196	-0.099	0.79	1.10	-0.31	6.59	11.55	-4.96
BEVERAGES	0.063	0.046	0.017	0.078	0.041	0.037	0.148	0.094	0.053	0.189	0.392	-0.203	1.15	1.31	-0.16	9.63	15.46	-5.83
CHEMICALS	0.070	0.032	0.038	0.080	0.029	0.051	0.172	0.080	0.092	0.244	0.274	-0.029	1.24	1.18	0.06	8.07	13.24	-5.17
CONSTRUCTION	0.035	0.023	0.012	0.043	0.022	0.021	0.116	0.075	0.042	0.214	0.192	0.022	0.93	1.07	-0.13	6.79	11.39	-4.61
DIVERSIFIED	0.040	0.031	0.009	0.057	0.026	0.032	0.159	0.086	0.073	0.110	0.254	-0.144	1.01	1.11	-0.10	8.63	12.27	-3.64
DRUGS, COSMETICS & HEALTH CARE	0.080	0.046	0.034	0.046	0.027	0.019	0.169	0.073	0.097	0.276	0.520	-0.245	1.85	2.10	-0.25	11.60	10.41	1.19
ELECTRICAL	0.041	0.029	0.012	0.071	0.029	0.042	0.158	0.078	0.080	0.155	0.264	-0.109	1.21	1.24	-0.03	10.14	12.16	-2.01
ELECTRONICS	0.043	0.028	0.015	0.053	0.024	0.029	0.183	0.069	0.113	0.154	0.370	-0.217	1.32	1.58	-0.26	8.29	11.07	-2.78
FINANCIAL	0.060	0.078	-0.017	0.028	0.010	0.018	0.130	0.084	0.045	0.577	0.472	0.105	1.05	1.02	0.04	8.77	12.48	-3.71
FOOD	0.037	0.025	0.013	0.059	0.032	0.026	0.146	0.082	0.064	0.126	0.245	-0.119	1.07	1.16	-0.09	7.70	13.34	-5.64
MACHINERY & EQUIPMENT	0.027	0.025	0.002	0.059	0.024	0.035	0.176	0.070	0.105	0.110	0.263	-0.153	1.06	1.19	-0.13	6.31	12.69	-6.38
METAL PRODUCERS	0.128	0.028	0.101	0.053	0.012	0.042	0.123	0.039	0.084	0.242	0.220	0.022	1.22	1.12	0.10	8.86	6.52	2.33
METAL PRODUCT MANUFACTURERS	0.034	0.024	0.010	0.052	0.025	0.027	0.131	0.068	0.063	0.093	0.215	-0.122	0.83	1.09	-0.26	6.63	11.69	-5.06
MISCELLANEOUS	0.040	0.023	0.017	0.052	0.026	0.026	0.151	0.076	0.076	0.179	0.285	-0.106	1.18	1.28	-0.10	6.53	11.51	-4.99
OIL, GAS, COAL & RELATED SERVICES	0.056	0.041	0.015	0.051	0.025	0.026	0.129	0.070	0.059	0.250	0.383	-0.133	1.04	1.24	-0.20	6.12	10.47	-4.35
PAPER	0.056	0.028	0.028	0.066	0.025	0.041	0.172	0.075	0.097	0.149	0.240	-0.091	1.17	1.07	0.10	8.65	11.24	-2.59
PRINTING & PUBLISHING	0.075	0.048	0.027	0.074	0.045	0.029	0.154	0.114	0.040	0.142	0.355	-0.213	1.49	1.44	0.05	8.61	14.12	-5.51
RECREATION	0.068	0.032	0.035	0.047	0.027	0.021	0.138	0.071	0.067	0.301	0.395	-0.093	1.21	1.34	-0.13	7.67	12.44	-4.77
RETAILERS	0.028	0.018	0.011	0.065	0.033	0.032	0.181	0.093	0.088	0.151	0.272	-0.121	1.17	1.21	-0.03	9.04	13.58	-4.54
TEXTILES	0.048	0.022	0.026	0.060	0.020	0.039	0.112	0.060	0.052	0.127	0.219	-0.091	0.90	1.01	-0.11	6.23	8.85	-2.63
TOBACCO	0.051	0.073	-0.023	0.090	0.059	0.031	0.175	0.183	-0.009	0.121	0.278	-0.158	0.86	1.45	-0.59	5.57	11.18	-5.61
TRANSPORTATION	0.049	0.024	0.025	0.066	0.022	0.045	0.159	0.072	0.087	0.187	0.239	-0.051	1.17	1.10	0.07	7.87	11.88	-4.01
UTILITIES	0.057	0.064	-0.007	0.047	0.033	0.015	0.134	0.108	0.026	0.264	0.423	-0.159	1.42	1.14	0.27	11.89	11.22	0.67
Average	0.052	0.035	0.017	0.059	0.028	0.030	0.147	0.083	0.064	0.191	0.302	-0.111	1.13	1.24	-0.10	8.00	11.68	-3.68

Table 5: Firm Level (Worldscope) Evidence on Profitability: The Level of Profitability – Variation Across Time

	Net Income/Sales			Net Income/Assets			Net Income/Equity			Gross Margin			Market to Book Assets			Price/Earnings Ratio		
	ZAF	World	Diff	ZAF	World	Diff	ZAF	World	Diff	ZAF	World	Diff	ZAF	World	Diff	ZAF	World	Diff
1980	0.063	0.038	0.025	0.074	0.037	0.037	0.210	0.128	0.082	0.821	0.254	0.568	1.20	1.01	0.19	6.45	8.42	-1.97
1981	0.062	0.035	0.027	0.079	0.035	0.044	0.239	0.123	0.116	0.811	0.253	0.558	1.10	1.00	0.10	5.54	8.33	-2.79
1982	0.059	0.030	0.029	0.070	0.028	0.042	0.185	0.104	0.081	0.514	0.258	0.256	0.98	1.02	-0.04	5.51	10.23	-4.72
1983	0.047	0.031	0.016	0.049	0.029	0.020	0.158	0.103	0.055	0.286	0.253	0.033	1.03	1.11	-0.08	8.22	12.39	-4.17
1984	0.048	0.036	0.013	0.059	0.034	0.025	0.151	0.114	0.037	0.374	0.253	0.121	1.01	1.09	-0.08	8.56	10.98	-2.42
1985	0.037	0.034	0.003	0.036	0.030	0.006	0.136	0.107	0.028	0.247	0.252	-0.005	1.01	1.16	-0.15	8.18	13.63	-5.45
1986	0.039	0.033	0.006	0.039	0.028	0.011	0.141	0.102	0.040	0.254	0.254	0.000	1.03	1.23	-0.20	9.24	14.78	-5.54
1987	0.052	0.039	0.013	0.063	0.031	0.032	0.177	0.105	0.072	0.145	0.269	-0.124	1.19	1.18	0.01	9.87	12.59	-2.72
1988	0.060	0.043	0.017	0.075	0.032	0.043	0.190	0.113	0.077	0.155	0.272	-0.117	1.08	1.22	-0.14	6.63	12.36	-5.73
1989	0.068	0.041	0.027	0.080	0.031	0.049	0.212	0.107	0.105	0.157	0.269	-0.112	1.16	1.27	-0.11	7.84	13.62	-5.78
1990	0.054	0.034	0.020	0.067	0.026	0.040	0.199	0.090	0.109	0.150	0.264	-0.114	1.14	1.13	0.01	8.30	11.88	-3.59
1991	0.055	0.030	0.025	0.064	0.021	0.042	0.166	0.078	0.088	0.136	0.268	-0.131	1.21	1.17	0.04	10.07	14.34	-4.28
1992	0.048	0.028	0.020	0.053	0.020	0.033	0.136	0.074	0.062	0.128	0.269	-0.141	1.12	1.14	-0.02	11.20	14.45	-3.24
1993	0.052	0.032	0.020	0.057	0.019	0.038	0.127	0.077	0.049	0.130	0.273	-0.143	1.12	1.22	-0.09	11.32	16.11	-4.79
1994	0.055	0.038	0.017	0.057	0.023	0.033	0.128	0.085	0.043	0.131	0.281	-0.150	1.35	1.22	0.13	14.85	14.61	0.24
1995	0.056	0.040	0.015	0.064	0.024	0.040	0.141	0.086	0.055	0.136	0.282	-0.146	1.32	1.19	0.13	12.61	13.99	-1.38
1996	0.053	0.040	0.013	0.063	0.024	0.040	0.158	0.083	0.074	0.129	0.288	-0.159	1.33	1.24	0.09	12.62	14.70	-2.08
1997	0.056	0.038	0.018	0.056	0.022	0.035	0.143	0.083	0.060	0.158	0.297	-0.139	1.28	1.22	0.06	12.54	15.19	-2.64
1998	0.056	0.030	0.026	0.048	0.016	0.032	0.117	0.070	0.046	0.165	0.308	-0.143	1.18	1.12	0.07	8.20	11.38	-3.18
1999	0.060	0.032	0.028	0.043	0.016	0.027	0.129	0.069	0.060	0.166	0.312	-0.146	1.12	1.14	-0.02	7.98	10.36	-2.38
2000	0.042	0.032	0.010	0.039	0.016	0.023	0.129	0.065	0.064	0.250	0.314	-0.064	1.05	1.09	-0.03	6.29	8.37	-2.09
2001	0.036	0.024	0.011	0.039	0.012	0.027	0.126	0.053	0.072	0.290	0.310	-0.020	1.01	1.07	-0.06	5.34	7.44	-2.10
2002	0.034	0.024	0.010	0.039	0.012	0.027	0.115	0.051	0.064	0.321	0.308	0.014	1.01	1.06	-0.04	5.88	7.44	-1.57
2003	0.033	0.029	0.003	0.041	0.016	0.024	0.126	0.061	0.065	0.315	0.314	0.002	1.07	1.16	-0.09	6.26	10.74	-4.48
2004	0.048	0.021	0.027	0.062	0.019	0.043	0.138	0.050	0.088	0.382	0.231	0.151	1.06	1.01	0.05	6.89	16.79	-9.90
Average	0.051	0.033	0.018	0.057	0.024	0.032	0.155	0.087	0.068	0.270	0.276	-0.006	1.13	1.14	-0.01	8.66	12.20	-3.55

Table 6: Firm Level (Worldscope) Evidence on Profitability: The Level of Profitability – Variation Across Firm Size and Time

	Net Income/Sales						
	ZAF			World			
	Large	Small	Diff	Large	Small	Diff	Diff in Diff
1980	0.053	0.064	-0.012	0.037	0.041	-0.004	-0.008
1981	0.055	0.090	-0.035	0.035	0.038	-0.003	-0.033
1982	0.034	0.068	-0.035	0.028	0.035	-0.006	-0.028
1983	0.031	0.081	-0.050	0.029	0.036	-0.008	-0.043
1984	0.034	0.067	-0.033	0.033	0.040	-0.007	-0.025
1985	0.031	0.051	-0.020	0.030	0.039	-0.009	-0.012
1986	0.041	0.043	-0.002	0.031	0.038	-0.007	0.005
1987	0.051	0.060	-0.008	0.036	0.042	-0.006	-0.003
1988	0.055	0.082	-0.027	0.042	0.046	-0.004	-0.023
1989	0.059	0.090	-0.031	0.039	0.044	-0.005	-0.026
1990	0.049	0.074	-0.024	0.032	0.037	-0.004	-0.020
1991	0.050	0.068	-0.018	0.028	0.031	-0.004	-0.014
1992	0.045	0.055	-0.010	0.027	0.030	-0.003	-0.007
1993	0.047	0.057	-0.010	0.030	0.033	-0.003	-0.007
1994	0.049	0.058	-0.009	0.038	0.038	0.000	-0.009
1995	0.059	0.054	0.005	0.041	0.039	0.002	0.003
1996	0.050	0.052	-0.002	0.041	0.039	0.002	-0.004
1997	0.061	0.054	0.007	0.040	0.035	0.006	0.001
1998	0.057	0.051	0.007	0.033	0.025	0.008	-0.001
1999	0.067	0.040	0.027	0.035	0.025	0.010	0.016
2000	0.057	0.013	0.043	0.035	0.027	0.008	0.035
2001	0.045	0.013	0.032	0.027	0.020	0.006	0.026
2002	0.042	0.020	0.022	0.027	0.019	0.007	0.014
2003	0.048	0.008	0.040	0.033	0.023	0.011	0.029
2004	0.054	0.035	0.020	0.021	0.021	0.000	0.019
Average	0.049	0.054	-0.005	0.033	0.034	0.000	-0.005

Table 7: Listed Firm vs. Industry (All Firm) Profitability by Industry

	Operating Income (Listed) /Sales & Value Added/Output (All)						
	ZAF			World			
	Listed	All	Ratio	Listed	All	Ratio	Ratio of Ra
Food products	0.084	0.126	0.67	0.050	0.162	0.31	2.1
Beverages	0.110	0.227	0.49	0.077	0.361	0.21	2.3
Tobacco	0.099	0.082	1.21	0.129	0.463	0.28	4.3
Textiles	0.056	0.145	0.39	0.052	0.205	0.25	1.5
Footwear, except rubber or plastic	0.097	0.170	0.57	0.070	0.187	0.37	1.5
Wood products, except furniture	0.047	0.107	0.44	0.049	0.205	0.24	1.9
Furniture, except metal	0.067	0.065	1.03	0.066	0.209	0.32	3.3
Paper and products	0.098	0.192	0.51	0.067	0.206	0.32	1.6
Printing and publishing	0.081	0.158	0.51	0.086	0.232	0.37	1.4
Industrial chemicals	0.140	0.198	0.70	0.077	0.237	0.32	2.2
Other chemicals	0.082	0.136	0.60	0.074	0.259	0.29	2.1
Misc. petroleum and coal products	0.054	0.228	0.24	0.078	0.207	0.37	0.6
Rubber products	0.115	0.173	0.66	0.055	0.225	0.25	2.7
Plastic products	0.080	0.157	0.51	0.063	0.227	0.28	1.8
Pottery, china, earthenware	0.116	0.201	0.58	0.060	0.289	0.21	2.8
Glass and products	0.175	0.368	0.48	0.093	0.277	0.34	1.4
Other non-metallic mineral products	0.098	0.209	0.47	0.065	0.267	0.24	1.9
Iron and steel	0.091	0.277	0.33	0.050	0.187	0.27	1.2
Non-ferrous metals	0.077	0.379	0.20	0.049	0.169	0.29	0.7
Machinery, except electrical	0.045	0.199	0.23	0.051	0.222	0.23	1.0
Machinery, electric	0.066	0.067	0.98	0.056	0.226	0.25	3.9
Transport equipment	0.054	0.115	0.47	0.050	0.184	0.27	1.7
Professional & scientific equipment	0.084	0.409	0.20	0.068	0.252	0.27	0.8
Other manufactured products	0.071	0.454	0.16	0.059	0.223	0.26	0.6
Wearing apparel and Leather Products	0.050	0.136	0.37	0.059	0.183	0.32	1.2
Average	0.085	0.199	0.52	0.059	0.234	0.29	1.9

Table 8: PMGE Results for Average Manufacturing Sector Mark-up

	μ-1	**ϕ (ECM)**	**h-test**	**RLL**	**LR**
1971-2004	0.54* (0.02)	-0.87* (0.07)	0.98 [0.32]	951.06	364.39 [0.00]
1971-1980	0.79* (0.02)	-1.02* (0.06)	0.40 [0.53]	327.57	332.29 [0.00]
1975-1984	0.50* (0.01)	-1.01* (0.02)	1.91 [0.17]	245.47	425.16 [0.00]
1981-1990	0.57* (0.01)	-0.94* (0.04)	0.74 [0.39]	281.41	333.49 [0.00]
1985-1994	0.70* (0.01)	-0.98* (0.09)	0.96 [0.33]	393.46	368.42 [0.00]
1991-2000	0.50* (0.03)	-1.12* (0.08)	1.93 [0.16]	258.80	122.53 [0.00]
1995-2004	0.62* (0.06)	-1.05* (0.06)	0.98 [0.32]	228.63	91.16 [0.00]

Note: * denotes significance at the 5% level, (s.e.), [p-value]

Table 9: ADF Test Statistic (using AIC(5) to select lag order)	Variable:			
	NSR		ROEG	
Manufacturing 3-digit Sectors	**I(0)**	**I(1)**	**I(0)**	**I(1)**
Food	-4.66		-5.45	
Beverages	-4.67		-5.35	
Tobacco	-5.07		-6.61	
Textiles	-3.95		-5.84	
Wearing apparel	-4.03		-5.78	
Leather & leather products	-4.55		-5.82	
Footwear	-3.00		-5.61	
Wood & wood products	-4.67		-5.16	
Paper & paper products	-4.10		-4.71	
Printing, publishing & recorded media	-4.55		-4.54	
Coke & refined petroleum	-5.62		-5.55	
Basic chemicals	-4.73		-5.98	
Other chemicals & man-made fibers	-4.76		-5.84	
Rubber products	-4.67		-4.80	
Plastic products	-3.91		-4.86	
Glass & glass products	-3.57		-5.59	
Non-metallic minerals	-3.81		-5.44	
Basic iron & steel	-2.77*	-6.48	-5.64	
Basic non-ferrous metals	-5.02		-5.20	
Metal products excluding machinery	-4.41		-5.52	
Machinery & equipment	-4.92		-5.46	
Electrical machinery & apparatus				
Television, & communication equipment	-4.47		-4.94	
Professional & scientific equipment	-4.77		-7.31	
Motor vehicles, parts & accessories	-3.26		-5.31	
Other transport equipment	-5.07		-4.21	
Furniture	-3.93		-5.32	
Other manufacturing	-5.62		-5.73	
Note: * denotes rejection of the null of no unit root				

Table 10: Estimated (ARDL) Mark-up by Individual Three Digit Sector								
Manufacturing 3-digit Sectors	**1971-2004**	**(s.e.)**	**1971-1980**	**1975-1984**	**1981-1990**	**1985-1994**	**1991-2000**	**1995-2004**
Food	0.86*	(0.10)	0.79	0.87	0.61	0.70	0.68	1.08
Beverages	1.07*	(0.12)	1.45	1.47	0.97	1.30	1.17	2.29
Tobacco	4.05*	(0.58)	4.27	0.73	5.03	3.79	2.16	-7.79
Textiles	0.51*	(0.06)	0.49	0.56	0.30	0.39	0.82	1.26
Wearing apparel	0.29*	(0.07)	0.35	0.29	0.19	0.26	0.24	0.63
Leather & leather products	0.16*	(0.03)	0.17	0.13	0.21	0.26	0.07	-0.25
Footwear	0.14*	(0.04)	0.10	0.14	0.10	0.15	-0.69	0.47
Wood & wood products	0.55*	(0.06)	0.93	0.79	0.59	0.77	-0.24	0.22
Paper & paper products	0.84*	(0.09)	0.17	0.81	0.73	0.81	1.02	1.19
Printing, publishing & recorded media	0.28*	(0.06)	0.35	0.39	0.31	0.45	1.19	0.07
Coke & refined petroleum	3.31*	(0.60)	1.55	2.90	2.93	2.98	4.74	2.12
Basic chemicals	0.83*	(0.11)	0.89	0.79	0.34	0.84	5.05	0.59
Other chemicals & man-made fibers	0.70*	(0.06)	0.40	0.93	0.61	0.76	0.29	0.29
Rubber products	0.52*	(0.06)	0.58	0.60	0.42	0.48	0.03	0.07
Plastic products	0.69*	(0.09)	0.45	0.75	0.50	0.56	1.82	0.85
Glass & glass products	**		0.28	0.40	0.58	0.65	0.84	1.36
Non-metallic minerals	0.96*	(0.25)	0.70	0.79	0.58	0.62	0.29	1.03
Basic iron & steel	0.60*	(0.11)	0.54	0.54	0.24	0.24	0.24	1.52
Basic non-ferrous metals	0.77*	(0.12)	2.75	1.35	0.76	1.16	0.62	1.55
Metal products excluding machinery	0.41*	(0.05)	0.44	0.46	0.32	0.40	0.30	0.79
Machinery & equipment	0.29*	(0.05)	0.14	0.23	0.25	0.39	0.36	0.27
Electrical machinery & apparatus	0.49*	(0.05)	0.93	0.72	0.45	0.62	0.38	-0.01
Television, & communication equipment	0.46*	(0.05)	0.28	0.39	0.44	0.42	0.53	0.52
Professional & scientific equipment	0.52*	(0.06)	0.74	0.61	0.53	0.82	0.98	1.12
Motor vehicles, parts & accessories	0.39*	(0.10)	0.46	0.42	0.19	0.51	0.74	1.41
Other transport equipment	0.36*	(0.08)	0.70	0.49	0.46	0.50	-0.04	0.11
Furniture	0.20*	(0.03)	0.42	0.28	0.18	0.26	0.30	0.42
Other manufacturing	2.16*	(0.19)	3.12	2.00	2.09	3.28	5.73	4.50
Note: * denotes significance at the 5% level, ** denotes case in which statistically reliable results were not available								

Table 11: Summary of Recent Mark-up Behaviour

	Change in mark-up from 1991-2000 to 1995-2004		
Level of mark-up in 1991-2000	**Increase**	**Decrease**	**Less than 10% change**
High (above 80%)	Beverages Textiles Paper Glass Pro and sci eq Furniture	Tobacco Printing** Coke* Basic chemicals** Plastic* Other manufacturing**	
Medium	Food Basic non-ferrous metals** Motor		Television, & comm eq
Low (below 40%)	Wearing apparel Footwear Wood* Non-metallic minerals Basic iron and steel Metal Other transport eq	Leather	Chemicals** Rubber** Machinery

Note:
*** change is off singular low or high**
**** change does not reflect trend - entire series should be looked at**

Table 12: Lerner Index Proxy Measures by Industry

	Average 1970-2004	10-yr Moving Averages 1970-1979	1975-1984	1980-1989	1985-1994	1990-1999	1995-2004
Food	0.33	0.33	0.35	0.35	0.33	0.30	0.32
Beverages	0.48	0.48	0.47	0.47	0.48	0.48	0.47
Tobacco	0.82	0.83	0.79	0.79	0.79	0.80	0.84
Textiles	0.19	0.22	0.23	0.21	0.20	0.13	0.12
Wearing Apparel	0.15	0.14	0.14	0.15	0.18	0.16	0.15
Leather & leather products	0.20	0.05	0.07	0.13	0.20	0.29	0.39
Footwear	0.16	0.05	0.07	0.09	0.12	0.19	0.36
Wood & wood products	0.29	0.23	0.28	0.34	0.36	0.33	0.26
Paper & paper products	0.33	0.28	0.32	0.32	0.34	0.34	0.37
Printing & publishing	0.20	0.17	0.19	0.22	0.25	0.27	0.18
Coke & refined petroleum	0.22	0.43	0.43	0.41	0.21	-0.18	-0.07
Basic chemicals	0.23	0.30	0.26	0.16	0.15	0.18	0.25
Other chemicals	0.29	0.29	0.29	0.28	0.29	0.29	0.30
Rubber products	0.25	0.26	0.27	0.27	0.25	0.25	0.23
Plastic products	0.29	0.30	0.33	0.33	0.33	0.29	0.20
Glass & glass products	0.22	0.16	0.22	0.26	0.29	0.20	0.21
Non metallic mineral products	0.24	0.24	0.26	0.22	0.17	0.16	0.28
Basic iron & steel	0.12	0.16	0.16	0.13	0.09	-0.02	0.10
Basic non-ferrous metals	0.32	0.19	0.31	0.36	0.35	0.32	0.42
Metal products	0.23	0.19	0.21	0.23	0.24	0.25	0.26
Machinery & equipment	0.21	0.20	0.19	0.20	0.23	0.22	0.21
Electrical machinery	0.31	0.30	0.31	0.31	0.29	0.31	0.33
Television & comms equipment	0.26	0.20	0.26	0.29	0.29	0.25	0.26
Professinal & scientific equip.	0.32	0.26	0.28	0.33	0.37	0.33	0.35
Motor vehicles	0.21	0.15	0.15	0.14	0.22	0.27	0.30
Other transport industry	0.26	0.38	0.31	0.34	0.33	0.16	0.07
Furniture	0.19	0.14	0.15	0.17	0.20	0.23	0.23
Other manufacturing	0.71	0.62	0.65	0.70	0.75	0.77	0.77

Table 13: Margins and Growth. Industry Evidence.

Dependent Variable: Real Labor Productivity Growth

	Sample of 115 countries			South Africa		
Price-Cost Margin t-1	-0.996 ***	-0.638 ***	-0.835 ***	-0.798 *	-0.767 ***	-1.279 ***
	0.181	0.073	0.130	0.413	0.212	0.441
(Price-Cost Margin t-1)^2			0.330 *			0.992 *
			0.169			0.556
Country Fixed Effects	Yes	Yes	Yes	-	-	-
Industry Fixed Effects	No	Yes	Yes	No	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	No	Yes	Yes
# Observations	1615	38520	38520	27	630	630
# Industries	1	27	27	1	27	27
R2	0.40	0.15	0.15	0.13	0.22	0.23

Note: Significance level: * 10%, ** 5%, *** 1%.
Errors are clustered at the country level and at the year level for the Sample of 115 countries and South Africa regressions, respectively.

Table 14: Margins and Growth. Firm-Level Evidence.

Dependent Variable: Real Labor Productivity Growth

	Sample of 56 countries						South Africa					
Price-Cost Margin t-1	-2.542 ***		-5.211 ***	-0.662 ***		-1.676 ***	-1.860 ***		-3.575 ***	-0.758 ***		-1.843 ***
	0.145		0.313	0.029		0.080	0.377		0.707	0.185		0.517
Price-Cost Margin t-1		-1.740 ***			-0.677 ***			-1.906 ***			-0.914 ***	
with Financial Costs		0.186			0.060			0.356			0.245	
(Price-Cost Margin t-1)^2			7.335 ***			2.805 ***			4.095 **			2.703 *
			0.650			0.194			1.606			1.526
Country Fixed Effects	-	-	-	Yes	Yes	Yes	-	-	-	-	-	-
Industry Fixed Effects	-	-	-	Yes	Yes	Yes	-	-	-	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
# Observations	68735	66436	68735	68735	66436	68735	760	729	760	760	729	760
# Firms	10502	10347	10502	10502	10347	10502	96	92	96	96	92	96
R2	0.25	0.23	0.26	0.04	0.04	0.05	0.28	0.28	0.29	0.14	0.15	0.14

Note: Significance level: * 10%, ** 5%, *** 1%.
Errors are clustered at the country level and at the year level for the Sample of 56 countries and South Africa regressions, respectively.

Table 15: Margins and Growth: IV Estimates

Dependent Variable: Real Labor Productivity Growth

	Industry Data		Firm-Level Data		
	All Countries	South Africa	All Countries		South Africa
Price-Cost Margin t-1	116.133	-0.309	-0.854	*	0.234
	2560.640	0.697	0.474		4.417
Country Fixed Effects	Yes	-	Yes		-
Industry Fixed Effects	Yes	Yes	Yes		Yes
Year Fixed Effects	Yes	Yes	Yes		Yes
Firm Fixed Effects	-	-	No		No
# Observations	24831	546	42510		650
R2	0.00	0.17	0.05		0.12
First-stage Regressions					
Coeff. of Instr. on Margins	0.00	0.011	-0.002	***	-0.005

Note: Significance level: * 10%, ** 5%, *** 1%.
Errors are clustered at the country level and at the year level for the Sample of "All Countries" and "South Africa" regressions, respectively.

Figure 1: Margins and Growth in South Africa: Aggregate Industry Data

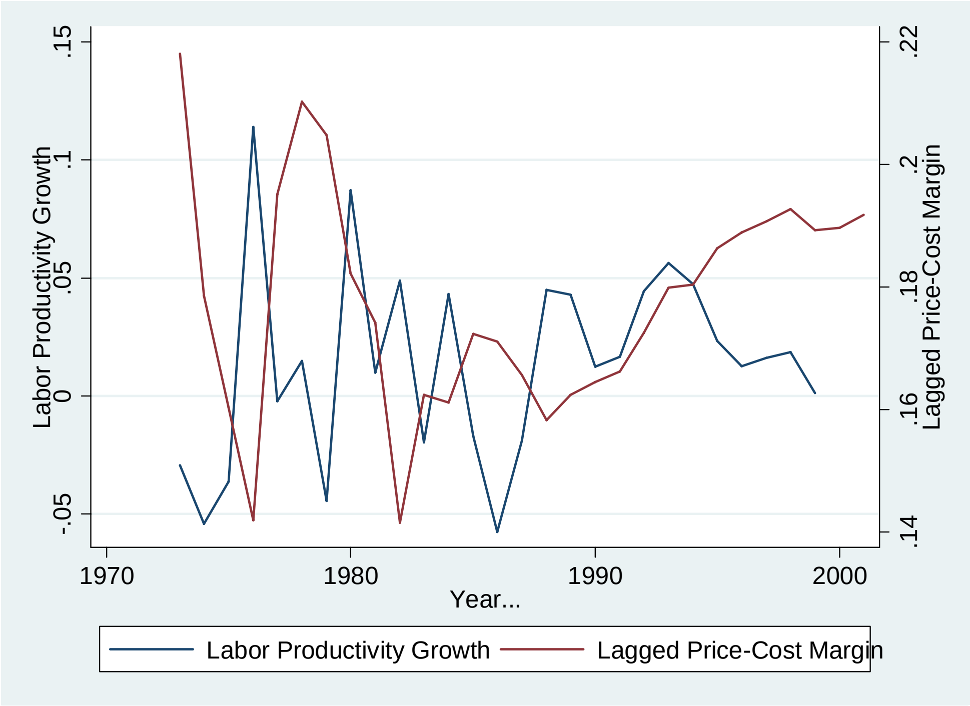

Figure 2: Margins and Growth in South Africa: Disaggregated Industry Data

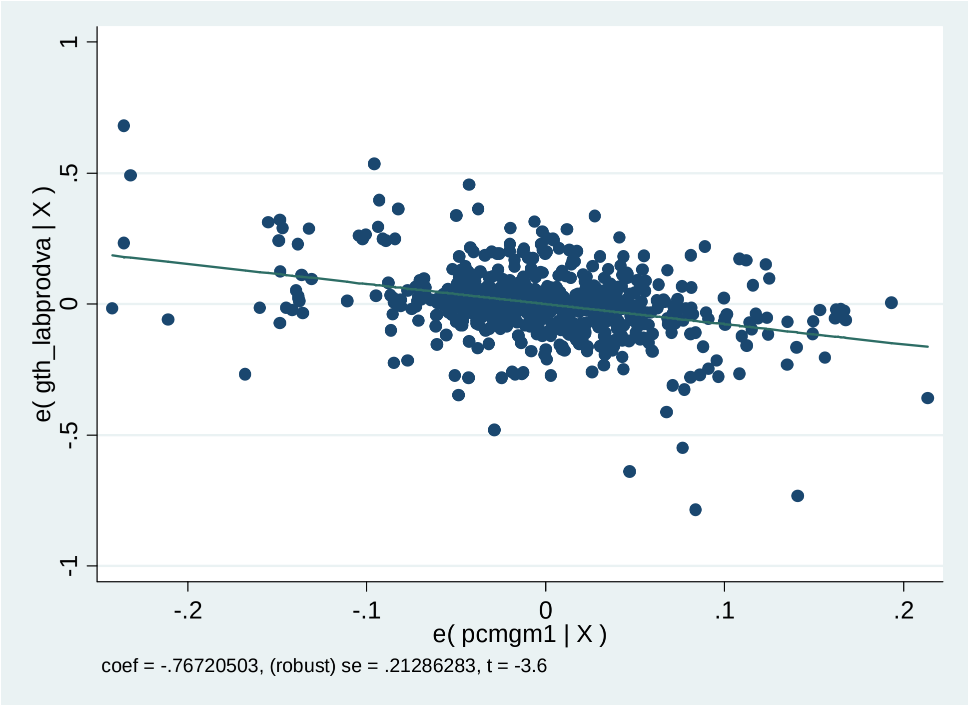

Table 16:
Dependent Variable: Productivity Growth (TFP Growth)
Sample Period: 1970-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Price-Cost Margin t-1	-0.12* (0.03)	-0.10* (0.03)	-0.12* (0.06)	-0.08 (0.07)	-0.10* (0.03)	-0.07 (0.06)	-0.11* (0.03)	-0.11* (0.06)
(Price-Cost Margin t-1)^2	-	-	-0.01 (0.14)	-0.04 (0.16)	-	-0.13 (0.11)	-	0.11 (0.13)
ECM t-1					-1.05* (0.06)	-1.05* (0.05)	-1.08* (0.06)	-1.09* (0.05)
h-test					0.20 [0.65]	1.71 [0.43]	0.07 [0.79]	1.86 [0.40]
ARDL:					AIC(3)	AIC(3)	AIC(3)	AIC(1)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No	Yes	No	No	No	No
# Observations	924	924	924	924	924	924	924	924
# Industries	28	28	28	28	28	28	22	22
R2	0.01	0.15	0.02	0.15	0.97	0.93	0.97	0.95

Table 17:
Dependent Variable: Productivity Growth (TFP Growth)
Sample Period: 1988-2003

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Price-Cost Margin t-1	-0.20* (0.05)	-0.15* (0.07)	-0.24* (0.03)	-0.19* (0.05)	-0.06* (0.03)	-0.12* (0.03)	-0.08* (0.03)	-0.21* (0.06)
$(\text{Price-Cost Margin t-1})^2$	-	-	0.14** (0.10)	0.17* (0.09)	-	0.36* (0.06)	-	0.33* (0.11)
ECM t-1					-1.21* (0.08)	-1.33* (0.21)	-1.21* (0.08)	-1.13* (0.07)
h-test					1.66 [0.20]	3.06 [0.22]	2.44 [0.12]	1.59 [0.45]
ARDL:					AIC(2)	AIC(2)	AIC(2)	AIC(2)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No	Yes	No	No	No	No
# Observations	420	420	420	420	420	420	330	330
# Industries	28	28	28	28	28	28	22	22
R2	0.06	0.22	0.07	0.23	0.94	0.65	0.95	0.86

Table 18:
Dependent Variable: Productivity Growth (TFP Growth) – IV Estimation Results
Sample Period: 1988-2003

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(Price-Cost Margin t-1)-IV	-0.16 (0.11)	-0.15* (0.03)	0.92 (0.60)	-0.26 (0.36)	-0.34* (0.05)	-2.11* (0.06)	2.30* (0.37)	-31.49* (10.48)
[(Price-Cost Margin t-1)^2]-IV	-	-	-0.74 (0.38)	0.08 (0.23)	-	1.14* (0.07)	-	62.29* (19.71)
ECM t-1					-1.40* (0.14)	-1.48* (0.23)	-1.14* (0.08)	-1.71* (0.31)
h-test					14.62* [0.00]	0.54 [0.76]	1.45 [0.23]	0.37 [0.83]
ARDL:					AIC(3)	AIC(3)	AIC(2)	3,3,3
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No	Yes	No	No	No	No
# Observations	420	420	420	420	420	420	330	330
# Industries	28	28	28	28	28	28	22	22
R2	0.01	0.20	0.02	0.20	0.91	0.70	0.94	0.76

Table 18: PMGE Results for Manufacturing Sector Labour Adjustment					
1972-2004	β1	β2	**σ-hat**	**Lab adj (σ-hat)**	**Lab adj (σ=1)**
AIC(1)	0.42*	-4.88*	0.70	3.43	4.88
	(0.15)	(0.15)			
AIC(2)	0.67*	-4.74*	0.60	2.84	4.74
	(0.14)	(0.15)			
AIC(3)	0.59*	-4.76*	0.63	2.99	4.76
	(0.14)	(0.15)			
Note: * denotes significance at the 5% level					

Table 19: PMGE Results for Manufacturing Sector Labour Adjustment				
	Lab adj ("correct" σ)*		**Lab adj (σ=1)**	
Sub-period	**AIC(1)**	**AIC(2)**	**AIC(1)**	**AIC(2)**
1972-1986	3.54	2.76	4.63	4.25
1973-1987	3.51	3.36	4.56	4.27
1974-1988	3.71	4.06	4.40	4.06
1975-1989	3.35	2.75	4.34	4.33
1976-1990	3.28	2.17	4.32	3.35
1977-1991	2.35	1.75	3.61	2.59
1978-1992	2.50	2.02	4.13	2.77
1979-1993	2.42	1.68	4.29	5.46
1980-1994	2.43	1.13	4.84	1.87
1981-1995	2.58	2.80	4.94	4.79
1982-1996	2.62	2.78	4.63	4.77
1983-1997	3.29	2.27	5.00	2.27
1984-1998	2.72	2.43	4.84	4.19
1985-1999	5.69	1.96	5.69	1.50
1986-2000	6.79	3.66	3.69	1.56
1987-2001	3.50	3.40	3.50	2.62
1988-2002	2.45	1.83	4.58	3.76
1989-2003	4.23	**	4.23	**
1990-2004	**	**	**	**

*** See text for interpretation of "correct"**
**** Statistically reliable results not available**