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Competition and productivity growth in South Africa

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Abstract

This article shows that mark-ups are significantly higher in South African manufacturing industries than they are in corresponding industries worldwide. We test for the consequences of this low-level of product market competition on productivity growth. The results of the paper are that high mark-ups have a large negative impact on productivity growth in South African manufacturing industry. Our results are robust to three different data sources, two alternative measures of productivity growth, and three distinct measures of the mark-up. Controlling for potential endogeneity of regressors does not eliminate the findings.

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1. Introduction

Recent empirical studies (for example, Aghion *et al.*, 2005; Blundell, Griffith and Van Reenen, 1999; Nickell, 1996), have pointed to a positive effect of product market competition on productivity growth, particularly at low levels of competition. In this article we explore three different datasets, first to compare product market competition in South African manufacturing firms and sectors to that in the corresponding sectors worldwide, and second to assess the effect on productivity growth in South Africa of increasing product market competition.

The three datasets are: (i) industry-level panel data for South Africa and more than 100 countries since the mid-1960s, from the United Nations Industrial Development Organization (UNIDO); (ii) industry-level panel data over the period 1970–2004 from the Trade and Industrial Strategies (TIPS) database; (iii) firm-level panel data since the early 1980s 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 total factor productivity (TFP) growth.

Our main findings can be summarized as follows. Consistently over the three datasets, 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 samples, 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 South Africa and other countries over the most recent period. Higher past mark-ups are associated with lower current productivity growth rates. In particular, a 10 percent reduction in South African mark-ups would increase productivity growth in South Africa by 2–2.5 percent per year. Finally, when introducing a quadratic term on the right hand side 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 only qualifier to the finding is that the modelling strategy presented by the paper has not resolved all questions surrounding an appropriate instrumentation strategy. Nonetheless, results under instrumentation confirm that lack of product market competition enhances productivity growth.

The article 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 datasets 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 suggests avenues for further work.

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 $\bar{A}_t$ at the end of period t, satisfying:

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

where $\gamma > 1$.

In each country, the final good is produced with a continuum of intermediate inputs and we normalize the labour 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 $\min(A_{it}, \bar{A}_{t-1})$ 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 $A_{it-1} = \bar{A}_{t-1-j}$, that is, j steps behind the current frontier $\bar{A}_{t-1}$. 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. That is, by investing the quadratic R&D effort $(1/2)\gamma A_{it-1}\mu^2$ 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-2 sectors, and this in turn reflects a knowledge externality from more advanced sectors which limits the maximum distance of any sector to the technological frontier.

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

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

$$\mu_2 = 0,$$

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 $A_{it-1} = \bar{A}_{t-2}$ at the beginning of period t, end up with productivity $A_t = \bar{A}_{t-1}$ if they successfully innovate, and with productivity $A_t = \bar{A}_{t-2}$ otherwise. In either case, the competitive fringe can produce intermediate goods of the same quality but at cost χ instead of 1, such that the equilibrium profit is

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

with[2]

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

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

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

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

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

[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

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

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

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

which yields

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

In particular an increase in product market competition, measured as a 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.

Firms in type-0 sectors, that start at the current frontier, end up with productivity $\bar{A}_t$ if they innovate, and stay with their initial productivity $\bar{A}_{t-1}$ if they do not. But the competitive fringe can never get beyond producing quality $\bar{A}_{t-1}$. 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 $(1/\alpha) < \gamma\chi$ 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:

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

On the other hand, a type-0 firm that does not innovate, will keep its productivity equal to 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

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

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

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

so that in equilibrium

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

In particular an increase in product market competition, that is, 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 South African industry- or firm-level panel data as we shall see in the next sections.

3. Mark-ups in South Africa: measurement, data and empirical methodology

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. Results prove to be robust across three distinct datasets, covering both industry-level data as well as firm-level evidence, two alternative measures of pricing power, alternative measures of firm profitability, and hence for alternative levels of aggregation.

3.1 Measuring competitive pressure

Our interest lies in the link between productivity growth and competitive pressure in industries. One measure of competitive pressure is provided by the size of the mark-up of price over marginal cost of production. Measuring the size of the mark-up has a long history in the literature. Early approaches to the problem suffered both from an inability to ground derivations in a full general equilibrium framework and from the need to control for simultaneity bias in estimation with associated weak instrumentation.[3]

The modern literature has provided an important advance in this regard. Under the assumption of constant returns to scale, the primal computation of the Solow residual (SR), or growth in TFP, is related to the mark-up of prices over marginal cost. Hall (1990) demonstrates that:

$$\text{TFP} = \text{SR} = \Delta q - \alpha \cdot \Delta l - (1 - \alpha) \cdot \Delta k = (\mu - 1) \cdot \alpha \cdot (\Delta l - \Delta k) + \theta \qquad (1)$$

[3] See for instance the discussion in Coutts *et al*. (1978).

where $\mu = P/\text{MC}$, P denotes price, and MC denotes marginal cost. 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 A is the technology parameter. Under perfect competition $\mu = 1$, while imperfectly competitive markets allow $\mu > 1$.

Estimation of Equation (1) faces the standard difficulty of mark-up estimations 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, but unfortunately instrumentation strategies led to the estimation of implausibly high mark-ups.

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

$$\text{DSR} = \alpha \cdot \Delta w - (1 - \alpha) \cdot \Delta r - \Delta p = (\mu - 1) \cdot \alpha \cdot (\Delta w - \Delta r) + \theta \quad (2)$$

with w, r denoting the natural logs of the wage rate and rental price of capital respectively. While Equation (2) is subject to the same endogeneity problems and hence instrumentation problems as Equation (1), Roeger's insight was that subtraction of Equation (2) from Equation (1) would give us the nominal SR (NSR), given by:

$$\begin{aligned} \text{NSR} &= \Delta(p + q) - \alpha \cdot \Delta(w + 1) - (1 - \alpha) \cdot \Delta(r + k) \\ &= (\mu - 1) \cdot \alpha \cdot [\Delta(w + 1) - \Delta(r + k)] \end{aligned} \quad (3)$$

in which the productivity shocks (θ) have cancelled out, removing the endogeneity problem, and hence the need for instrumentation.

Extensions of the framework for identifying the extent of mark-up pricing provided by Equation (3), include relaxing the assumption of constant returns to scale, incorporating the impact of business cycles, import and export competition, market structure, and the use of alternative measures of output.[4]

This article follows the Roeger methodology in determining the strength of pricing power in South African manufacturing. However, given reliability concerns about capital stock data in the UNIDO and Worldscope datasets (in part its unavailability in these datasets), we also follow Aghion *et al.* (2005) in computing the extent of pricing power in an industry directly, using a proxy of the Lerner index given either by the differential between value-added and the total wage bill as a proportion of gross output:

[4] See the discussions in Hakura (1998), Oliveira Martins and Scarpetta (1999), and Fedderke, Kularatne and Mariotti (2007).

$$\text{PCM1} = \frac{\text{value added} - \text{total wages}}{\text{sales}} \tag{4}$$

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

$$\text{PCM2} = \frac{pY - \omega L - rK}{pY} \tag{5}$$

where pY denotes nominal GDP, ω 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.

For firm-level data we also add a range of measures of profitability, specifically the ratio of net income to sales, assets and equity respectively, as well as the gross margin, market : book ratio and the price : equity ratio.

Finally, two empirical measures for productivity growth are employed in the analysis: labour productivity growth, as well as TFP growth as given by the SR.

3.2 Data

This study employs three distinct sources of data:

1. Industry-level panel data for South Africa and for more than 100 countries since the mid-1960s, obtained from the UNIDO International Industry Statistics 2004.[5] 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 using Equation (4). Real labour 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 profit and loss items, and other basic firm characteristics. Series employed for this study include net income, sales, assets, value of equity, gross margin, market : book ratios, the price : equity ratio, as well as data on value-added output and wage costs. Margins are computed from Equation (4), and real labour productivity growth as the growth rate of real local currency sales per worker. The firm-level data are truncated to avoid the results being driven by a few outliers.

[5] UNIDO compiles its data from statistical agencies, but does not provide details on its sourcing.

Table 1. Three-digit manufacturing sectors included in study

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

3. Industry-level panel data for South Africa from the TIPS database.[6] 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 TIPS database. We employ a panel dataset 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 are 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. Margins are computed using Equation (5), and estimated using Equation (3). 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, generating a 28×16 panel of 448 observations.

Use of two alternative industry-level panel datasets, UNIDO and TIPS, is motivated by the fact that UNIDO covers a larger number of countries while TIPS provides more detailed data series on South Africa.

[6] TIPS compiles the data through a commercial service provider of data, Quantec, which in turn sources the data from a range of official statistical sources, including StatsSA and the South African Reserve Bank.

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.[7] 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. Standard deviations in mark-ups increase substantially post-1996 for all sectors, and increase even more markedly after 2000. This reflects increased volatility in the underlying series from which the mark-ups are computed.

3.3 Empirical estimates of mark-ups in South Africa

3.3.1 Industry-level data: results from the TIPS and UNIDO databases

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 3.1.[8] For the average manufacturing sector mark-up we employ the pooled mean group dynamic heterogeneous panel estimation (PMGE) methodology of Pesaran, Shin and Smith (1999),[9] thus controlling for both industry effects and dynamic adjustment to equilibrium over time. For individual sectors, estimation is carried-out using a cointegration-consistent autoregressive distributed lag methodology.[10]

We report PMGE results for the manufacturing sectors given by the specification (3), 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 dataset. Figure 1 summarises the evidence – full results including statistical diagnostics are reported in Table A1 of the Appendix. Estimations indicate the presence of an aggregate mark-up for the manufacturing sector over the full sample period of 54 percent, and while the rolling decade sub-periods show cyclical variation in the level of the mark-up, no robust evidence of a declining trend in the level of the mark-up emerges for South African manufacturing.[11]

From the individual three-digit manufacturing sectors the evidence is again of consistently significant mark-ups. Results are reported in Table A2 of the appendix.

[7] The input–output table of 2000 updated the predecessor of 1993, and has been subject only to minor revision since.

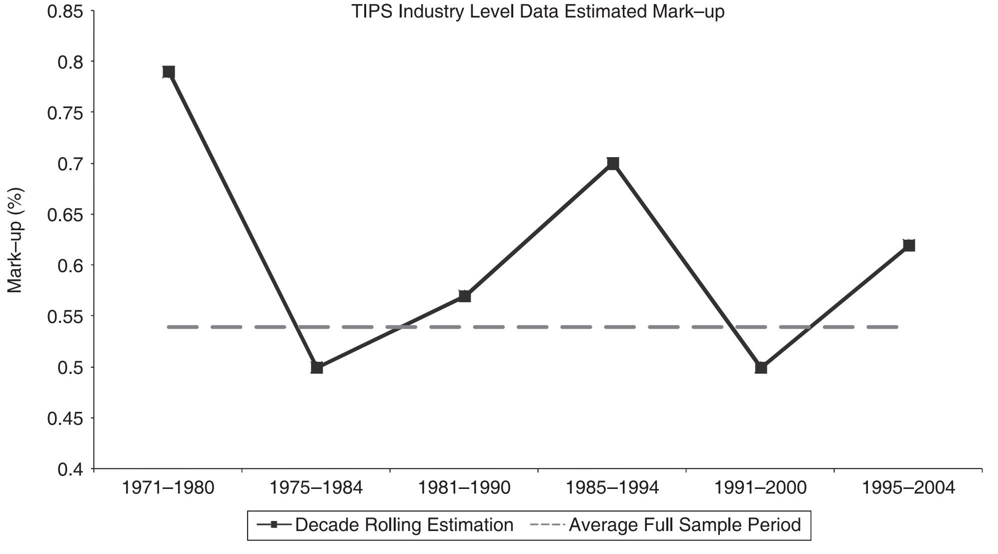
[8] In addition to the estimation approach we also computed the magnitude of the mark-up by solving Equation (3) for $\mu - 1$. The trend structure to emerge is consistent with that reported for the estimated results, though they prove subject to greater volatility given the noise, and other systematic components of the SR.

[9] See the detailed discussion of the estimation methodology in Fedderke (2004), particularly for applications to South African manufacturing data.

[10] See Pesaran, Shin and Smith (1996, 2001).

[11] Thus 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 subsample period.

Figure 1. Estimated average mark-up for South African manufacturing, industry-level data, TIPS database 1970–2004, and rolling decade sub-periods



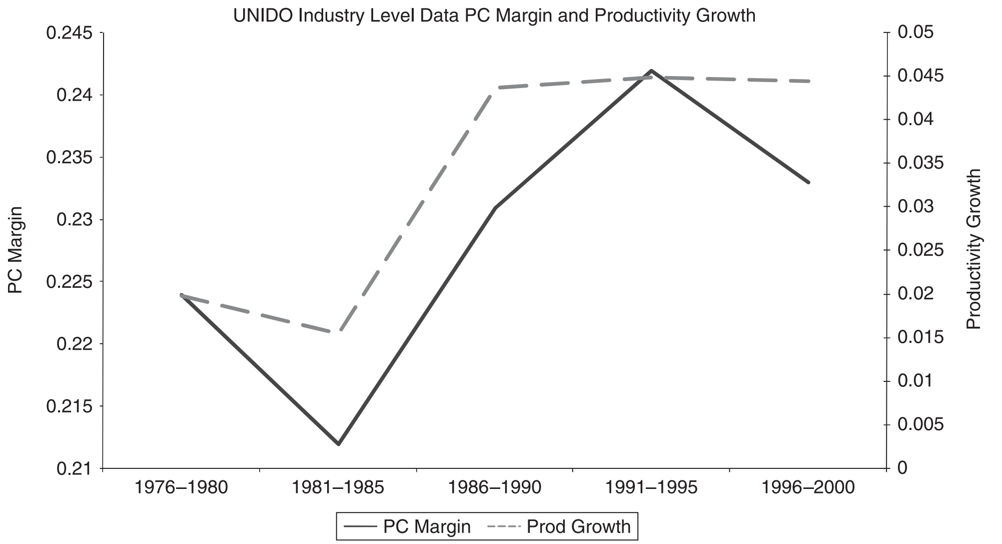
Consistent with the aggregate evidence for the average mark-up in the manufacturing sector as a whole, the evidence suggests that mark-ups in manufacturing industry have increased rather than decreased toward the end of the sample period. As a consistency check of our results, given the potential for high volatility in the SR, we also computed the alternative measure of pricing power provided by the direct proxy for the Lerner index reported in Section 3.1. Consistent with the remainder of the results reported thus far, the results again persistently indicate a non-declining pricing power in South African manufacturing industry.[12]

For the UNIDO database we compute price–cost margins as given by Equation (4), while real labour productivity growth is measured as the growth rate of real local currency value-added per worker. The absence of capital stock data in the UNIDO database precludes the use of the (3) specification. Figure 2 presents the measures of price–cost margins competition and growth of labour productivity averaged over all three-digit manufacturing industries in South Africa.[13] Full results are reported in Table A3 of the Appendix. Consistent with both the aggregate and industry-level evidence obtained from the TIPS database, once again the

[12] Full results available from the authors upon request.

[13] Due to data availability the price–cost margins we compute differ from the Lerner index traditionally used to gauge the degree of competition in that we use average instead of marginal costs.

Figure 2. Price–cost margin and labour productivity growth for South African manufacturing, industry-level data, UNIDO database, and rolling half decade sub-periods: 1976–2000



UNIDO database evidence supports an increase in the proxy of pricing power for South African manufacturing, suggesting a falling level of competitive pressure in these. However, the level of the price–cost margin is lower than that obtained from the estimation methodology employed in the case of the TIPS database, though of similar magnitude to the margin obtained from employing the (4) measure for the TIPS data.

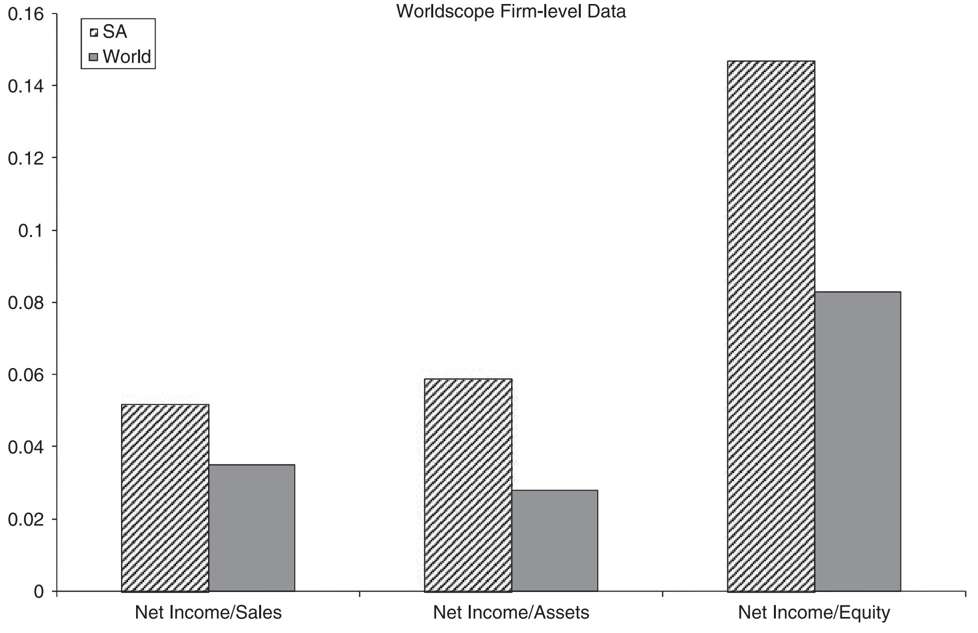
3.3.2 Firm-level data: results from the Worldscope database

In order to explore the degree of competition in South Africa we analyze firm-level data corresponding to listed firms in 56 countries in the period 1980–2004. We investigate several indicators of profitability across industries and over time. In order to make the analysis robust, we eliminate influential outliers and report the median.

Firms listed in South Africa exhibit around 50 percent higher profitability when this is measured with Net Income : Sales, Net Income : Assets, and Net Income : Equity ratios.[14] Summary results are reported in Figure 3. Note that the

[14] Though we note that the Gross-Margins, Market : Book Ratios, and Price : Earnings Ratios of South African firms are lower than their international counterparts.

Figure 3. Firm profitability by alternative measures; South Africa and average of 60 countries worldscope database, 1980–2004



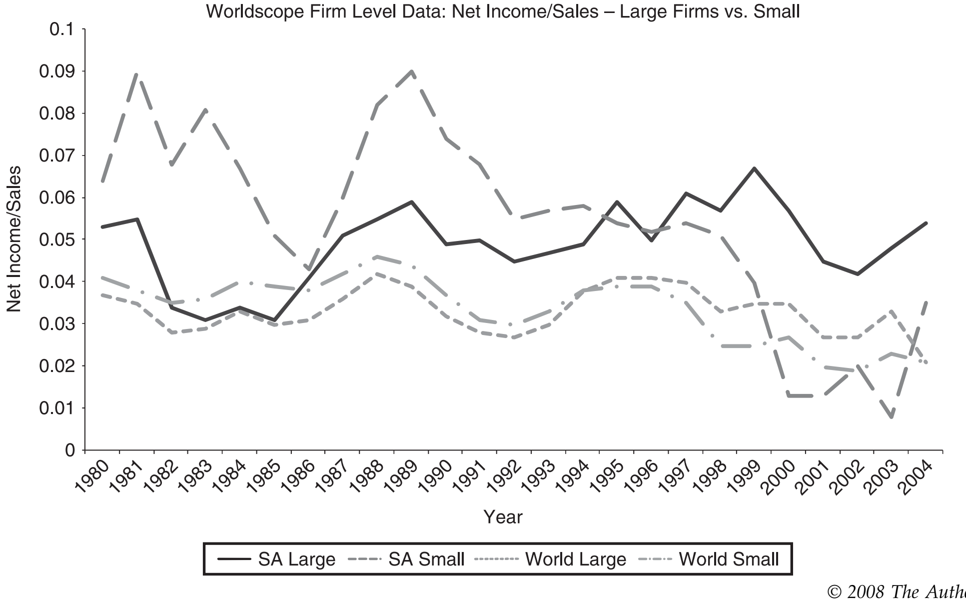
differences between South Afican firms and firms on average in the 60 comparator countries, are in general statistically significant and robust to controlling for total and per capita GDP. Moreover, consistent with the findings for the two aggregate industry-level databases, these patterns do not show systematic variation in time – see Figure 4.

There are also no significant consistent differences between large and small firms either in South Africa or in the world as a whole – see the results reported in Figure 5 – though it is notable that the margin between small and large firms is more pronounced in South Africa than on average across the world, and that the returns for small firms in South Africa fell toward world levels toward the end of the sample period. Thus in the most recent period large firms have switched from being less (10 percent lower), to more (50 percent higher) profitable than small firms in South Africa.

As a final robustness check we considered the aggregate industry price–cost margins in the manufacturing sector, as computed for the UNIDO industry database, relative to those of the listed firms in the Worldscope dataset. Price–cost margin is defined as value-added over output for the industry aggregates and as operating

Figure 4. Firm profitability over time; South Africa and average of 60 countries worldscope database, 1980–2004

Figure 5. Firm profitability by size; South Africa and average of 60 countries worldscope database, 1980–2004



income over sales for listed firms. The ratio between the margins for listed firms and all firms was found to be about twice as large in South Africa as in the world as a whole. The difference is observed across virtually all sectors, although it is especially large in Tobacco, Furniture and Electric Machinery. Across all sectors, for South Africa the ratio of the listed firm to industry profitability measure is 0.52, for the world is 0.29, giving a ratio of ratios of 1.9. Results from firm-level and industry-level data are thus consistent.

4. Market competition and productivity growth in South Africa

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 datasets, covering both industry-level data as well as firm-level evidence, and 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.

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

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:

$$P\text{growth}_{it} = \alpha + \beta \text{PCM}_{it-1} + I_i + I_t + \varepsilon_{it}, \tag{6}$$

where $P\text{growth}_{it}$ denotes a measure of productivity growth in sector i at time t, PCM_{it} is the lagged measure of competitive pressure as computed in Equation (4), and I_i and I_t stand for industry and year fixed effects.

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. Given our approach to measurement and estimation in this article, this danger could arise either since marginal and average costs divergence may differ across industries due to differential economies of scale, or since the exclusion of capital costs from the PCM measure may have a differential effect across industries sorted on capital intensity. However, as long as these characteristics do not vary systematically in time, fixed effects resolves the issue.

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

Table 2. Margins and growth. Industry evidence: UNIDO database, 1976–2000

Dependent variable: real labour 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
Number of observations	1,615	38,520	38,520	27	630	630
Number of industries	1	27	27	1	27	27
R^2	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.

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.

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. As the results of Table 3 demonstrate, cross firm variation is significant, with the productivity effect of the price–cost margin measure approximately halving where firm fixed effects are not controlled for in the South African data, and with an even more dramatic variation for the world data. One interpretation of the evidence is of a relatively wide dispersion of margins across firms, making control of the heterogeneity important in isolating productivity growth effects.

Tables 2 and 3 present the basic results using industry and firm-level data, respectively. In the first and fourth columns of Table 2 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 dataset, while the rest use data for South Africa alone.

The results strongly suggest that there is a positive effect of product market competition on productivity growth. All the coefficients for margins are negative

Table 3. Margins and growth. Firm-level evidence: Worldscope database, 1980–2004

Dependent variable: real labour 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
Number of observations	68,735	66,436	68,735	68,735	66,436	68,735	760	729	760	760	729	760
Number of firms	10,502	10,347	10,502	10,502	10,347	10,502	96	92	96	96	92	96
R^2	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.

and statistically significant at conventional values. The economic magnitude of the effect is also large. A 10 percent increase from the mean margin of 0.24 on the 115-country sample implies a decrease in productivity growth of 2.4 percent per year. For the typical industry this would mean reducing growth from 2.6 percent a year to a mere 0.2 percent. A similar change on margins in South Africa is associated with a decline of 1.6 percent per year, which would reduce the median growth from 1 percent to –0.6 percent.

Table 3 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 than we found in the industry data. Here a 10 percent 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 percent in the 56-country sample and 2.4 percent in South Africa. Again, these magnitudes are substantial since the median productivity growth rate is 1.2 and 1.8 percent in each sample.

The results are virtually unchanged when we include capital 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.*'s (2005) theoretical predictions and extend their results for British publicly-listed firms.

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). Unfortunately, import penetration turned out not to be a good instrument in most cases. The *F*-tests for the first-stage regressions could not reject the hypothesis that import penetration and margins are unrelated, and the coefficient for the former is generally not significantly negative (as the bottom part of Table 4 shows) in all but one of the regressions. We experimented with some other instruments such as the opening of the economy to trade, the degree of tradability of the industry, and the level of tariffs. In each case the results were similar: the instruments turned out to be weak ones. Our attempt to control for endogeneity was thus mostly unsuccessful. This means that the OLS evidence above should be interpreted cautiously for, even if we used lagged margins, the lack of good instruments did not allow us to rule out that the relation goes from productivity to margins and not the other way around.

Table 4. Margins and growth: IV estimates – UNIDO (1976–2000) and Worldscope (1980–2004) databases

Dependent Variable: Real Labour 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
	(2,560.640)	(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
Number of observations	24,831	546	42,510	650
R^2	0.00	0.17	0.05	0.12
First-stage regressions				
Coefficient of instrument 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.

On a brighter note, however, in the only case that import penetration appears to be a good instrument (firm-level, all countries sample in column 3) the IV estimate of the effect of margins – although smaller than before – enters negatively and statistically significantly. 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.

4.2 Competition and growth 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 database provided by TIPS. One advantage of the database 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 database allow for a more accurate computation of price–cost margins.

Given the discussion of Section 3.1, we estimate Equation (6) such that:

$$P\text{growth}_{it} = \alpha + \beta \text{PCM2}_{it-1} + I_i + I_t + \varepsilon_{it},$$

Table 5. Dependent variable: productivity growth (TFP Growth): TIPS database (Sample period: 1970–2004)

	(1)	(2)	(3)	(4)	(5) PMGE	(6) PMGE	(7) PMGE	(8) PMGE
Price–Cost Margin *t*–1	–0.12*	–0.10*	–0.12*	–0.08	–0.10*	–0.07	–0.11*	–0.11*
	(0.03)	(0.03)	(0.06)	(0.07)	(0.03)	(0.06)	(0.03)	(0.06)
(Price–Cost Margin *t*–1)^2	–	–	–0.01	–0.04	–	–0.13	–	0.11
			(0.14)	(0.16)		(0.11)		(0.13)
ECM *t*–1					–1.05*	–1.05*	–1.08*	–1.09*
					(0.06)	(0.05)	(0.06)	(0.05)
h-test					0.20	1.71	0.07	1.86
					[0.65]	[0.43]	[0.79]	[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
Number of observations	924	924	924	924	924	924	924	924
Number of industries	28	28	28	28	28	28	22	22
R^2	0.01	0.15	0.02	0.15	0.97	0.93	0.97	0.95

***Notes*:** *denotes value significance at the 5% level, (s.e.), [P-value].
The error-correction term (the ϕ-parameter), indicates adjustment to the long-run equilibrium. The *h*-test Hausman test statistic accepts the inference of an homogenous mark-up across all manufacturing sectors for the long-run specification.

where $P\text{growth}_{it-1}$ is the SR in sector i at time t, $PCM2$ is the proxy for the Lerner index as given by Equation (5), 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.

Table 5 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 using the pooled mean group estimator (PMGE). Results for the full sample period are reported in columns 5 through 8 of Table 5. 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 many of the industrial sectors,[15] we estimate both for the full industrial sample with 28 sectors (columns 5 and 6), and for a subset of 22 sectors which excludes sectors with doubtful data quality. For the PMGE estimates, the Hausman test statistic confirms the inference of a homogenous mark-up across all manufacturing sectors for the long-run specification, though short-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 subsample 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 (5) 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 percent reduction in the real growth rate as measured by growth in TFP.

Evidence from the detailed South African specific dataset is thus consistent with the international datasets considered 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 5. Neither the inverted-U specification, nor the statistical significance of the non-linearity is 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

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

Table 6. Dependent variable: productivity growth (TFP Growth): TIPS database (Sample period: 1988–2003)

	(1)	(2)	(3)	(4)	(5) PMGE	(6) PMGE	(7) PMGE	(8) PMGE
Price–Cost Margin t–1	–0.20*	–0.15*	–0.24*	–0.19*	–0.06*	–0.12*	–0.08*	–0.12*
	(0.05)	(0.07)	(0.03)	(0.05)	(0.03)	(0.03)	(0.03)	(0.06)
(Price–Cost Margin t–1)^2	–	–	0.14**	0.17*	–	0.36*	–	0.33*
			(0.10)	(0.09)		(0.06)		(0.11)
ECM t–1					–1.21*	–1.33*	–1.21*	–1.13*
					(0.08)	(0.21)	(0.08)	(0.07)
h-test					1.66	3.06	2.44	1.59
					[0.20]	[0.22]	[0.12]	[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
Number of observations	420	420	420	420	420	420	330	330
Number of industries	28	28	28	28	28	28	22	22
R^2	0.06	0.22	0.07	0.23	0.94	0.65	0.95	0.86

***Notes*:** *denotes value significance at the 5% level, (s.e.), [P-value].
The error-correction term (the ϕ-parameter), indicates adjustment to the long-run equilibrium. The h-test Hausman test statistic accepts the inference of an homogenous mark-up across all manufacturing sectors for the long-run specification.

instance by SIC three-digit manufacturing sector, as instruments. Given that earlier work on mark-ups in South Africa demonstrated that import competition serves to discipline pricing power in South African manufacturing, these measures of underlying structural factors promoting international competition should be correlated with our measure of product market competition. 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 6 we report results that replicate those of Table 5, to confirm the robustness of our findings for the 1988–2003 subsample. Within-group estimation results are reported in columns 1 through 4, and PMGE results in columns 5 through 8.[16] 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 addition, the inverted-U relationship that could

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

Table 7. Dependent variable: productivity growth (TFP Growth)–IV estimation results: TIPS database (Sample period: 1988–2003)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					PMGE	PMGE	PMGE	PMGE
(Price–Cost Margin t–1)-IV	–0.16	–0.15*	0.92	–0.26	–0.34*	–2.11*	2.30*	–31.49*
	(0.11)	(0.03)	(0.60)	(0.36)	(0.05)	(0.06)	(0.37)	(10.48)
[(Price–Cost Margin t–1)^2]-IV	–	–	–0.74	0.08	–	–1.14*	–	62.29*
			(0.38)	(0.23)		(0.07)		(19.71)
ECM t–1					–1.40*	–1.48*	–1.14*	–1.71*
					(0.14)	(0.23)	(0.08)	(0.31)
h-test					14.62*	0.54	1.45	0.37
					[0.00]	[0.76]	[0.23]	[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
Number of observations	420	420	420	420	420	420	330	330
Number of industries	28	28	28	28	28	28	22	22
R^2	0.01	0.20	0.20	0.20	0.91	0.70	0.94	0.76

***Notes*:** *denotes value significance at the 5% level, (s.e.), [P-value].
The error-correction term (the ϕ-parameter), indicates adjustment to the long-run equilibrium. The h-test Hausman test statistic accepts the inference of an homogenous mark-up across all manufacturing sectors for the long-run specification.

not 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 using the PMG estimator.

Finally, estimation results for the 1988–2003 subsample, in which the Lerner index proxy is instrumented on the trade protection measures detailed above (effective rates of protection, scheduled tariff rates, export taxes and a measure of anti-export bias), are reported in Table 7.

In terms of the quality of our instruments, while all instruments report 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. Nonetheless, the F-test of joint significance with respect to the Lerner measure returns a value of 30.25 under (4,363) degrees of freedom, suggesting that jointly they satisfy a necessary condition for instrument validity. 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 7. On the other hand, where we control for industry heterogeneity using the PMG estimator, the negative impact of the instrumented price–cost margin on productivity growth is statistically significant. Finally, for the PMG estimations, the inverted-U relationship finds further statistical confirmation, though in the case of the smaller subsample of sectors the magnitudes of the economic impacts are implausibly large. Nevertheless, results suggest that at least some of the relation between price–cost margins and growth is generated by margins affecting growth rather than vice versa.

Despite the fact that we have only imperfect instruments available, these results suggest that the relation between price–cost margins and growth is caused by margins affecting growth, not the other way around.[17] Recall, however, that for the TIPS data post-1996 inference faces caveats arising from the quality of the data.

5. Conclusion

In this article we have explored three alternative panel datasets 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 datasets, we found that: (i) mark-ups remain significantly higher in South African 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 article 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 article. 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 article await further research.

[17] We also explored the impact of competitive pressure on employment from the equation:

$$L_{it} = \alpha + \beta \text{PCM2}_{it} + I_i + \varepsilon_{it},$$

where L_{it} denotes employment in sector i at time t, and PCM2 is the proxy for the Lerner index as given by Equation (5). 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 are available from the authors on request.

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Appendix

Table A1. PMGE results for average manufacturing sector mark-up (TIPS database: 1970–2004)

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

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

The error-correction term (the ϕ-parameter), indicates adjustment to the long-run equilibrium. The *h*-test Hausman test statistic accepts the inference of an homogenous mark-up across all manufacturing sectors for the long-run specification.

Table A2. Estimated (ARDL) mark-up by individual three-digit sector, TIPS database, 1970–2004

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 and 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 and wood products	0.55*	(0.06)	0.93	0.79	0.59	0.77	–0.24	0.22
Paper and paper products	0.84*	(0.09)	0.17	0.81	0.73	0.81	1.02	1.19
Printing, publishing and recorded media	0.28*	(0.06)	0.35	0.39	0.31	0.45	1.19	0.07
Coke and 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 and man-made fibres	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 and 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 and 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 and equipment	0.29*	(0.05)	0.14	0.23	0.25	0.39	0.36	0.27
Electrical machinery and apparatus	0.49*	(0.05)	0.93	0.72	0.45	0.62	0.38	–0.01
Television, and communication equipment	0.46*	(0.05)	0.28	0.39	0.44	0.42	0.53	0.52
Professional and scientific equipment	0.52*	(0.06)	0.74	0.61	0.53	0.82	0.98	1.12
Motor vehicles, parts and 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 A3. South African UNIDO industry data: price–cost margins and labour productivity growth

Industry	1976–1980		1981–1985		1986–1990		1991–1995		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 and 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