Competition, Productivity and Corporate Control

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1. Introduction

An intuition among economists prompts that competition affects productivity in a positive way. Hicks's famous comment that "the best of all monopoly profits is the quiet life" (1935, p.8) and the common understanding that competition is the enemy of slack (Nickell, 1996) enforce this. Another often-cited reason is that a competitive equilibrium is Pareto optimal (e.g. Hart (1983)).

Despite this commonly accepted understanding, however, in the theoretical debate there is no dominant view about whether the relationship is positive or negative. With regard to the ways in which competition affects productivity, many propositions exist about the mechanism(s) of influence. In addition, the causality is most likely a two-way influence. In this paper, the focus is on the causal link that runs from competition to productivity, in order to explore some of the ideas in more detail, but the endogeneity of competition remains intrinsic.

In part, the lack of theoretical and empirical agreement stems from the almost unexpected complexity of this relationship and its specificity to different industry contexts. It is also partly due to a lack of clarity about the definitions of competition, efficiency, risk and other key concepts, the methods of measurement that give a most accurate reflection of these and a general disagreement about how the relationship can best be assessed empirically. This paper reviews the major theoretical arguments about the way in which competition influences productivity and considers the important empirical contributions in order to shed light on the knowns, unknowns and to compare the usefulness of different lines of enquiry into the competition-performance relationship.

The connection between competition and productivity bears importance for policy decisions in South Africa and there is some empirical evidence about the role of competitive forces in shaping productivity locally. While policy options remain outside the scope of this literature review, undoubtedly the question about how these theoretical and empirical debates can inform policy is part of the wider context.

The paper is structured as follows. Section 2 reviews the progression of the major theoretical arguments about the mechanisms through which competition influences productivity. Section 3 uses the 'taxonomy' of channels through which competition affects productivity in Holmes and Schmitz (2010) as a structure in order to discuss the empirical methods and evidence. Factors that can substitute for competitive pressure in shaping productivity are discussed in Section 4. A sketch of the South African evidence is presented in Section 5. Some of the complications in analysing the relationship under consideration in theory and practice are examined in Section 6. Section 7 concludes.

2. Major theoretical contributions

There is no generally accepted "workhorse model", which explains the mechanism through which a more competitive environment causes a change in productivity. The most influential theoretical arguments, which are reviewed below, present views about whether the relationship is positive, negative or ambiguous and propose a mechanism of influence. This is by no means an exhaustive discussion of all the models in this area, but it is rather an attempt to review the main ideas and lines of causality that have impacted thought and empirical work in understanding the connection between competition and productivity.

Arguments for a positive relationship

In the basic neoclassical paradigm, the relationship is positive – this centres on the fundamental economic proposition that a competitive equilibrium is Pareto optimal.
But how does a more competitive environment provide incentives for increased productivity?

Managerial effort

A number of theories explain the connection through heightened incentives for managerial effort. According to these models, while it is in the interest of both competitive and monopolistic firms' owners to maximise productivity and hence profits, the incentives differ for managers. If the firm has market power, part of the monopoly rents can be captured by managers and workers in the form of slack. The information asymmetry between owners and managers (the standard principal-agent problem) would allow this to occur. Several specific frameworks have been developed.

Nalebuff and Stiglitz's (1983) model of compensation and competition

Nalebuff and Stiglitz's model puts the spotlight on the role of relative performance in a competitive environment. The notion of competition here resembles a sports tournament, where relative ranking (and not absolute level of achievement) is what matters. This is unlike the static idea of perfect competition in the Arrow-Debreu model. The model is general in nature – its "agents" can be firms, managers, workers or students.

Its importance stems from its insight into the link between the number of players and the effect of explicit incentives (in this case referred to as prizes) on the effort exerted by agents in an environment where "principals" (government, firm owners or teachers) have no information about Even though the model does not connect product market competition to productivity explicitly, it sheds light on the process through which competition increases the effectiveness of incentives – both positive and negative (though likely in an asymmetric manner).

Hart's (1983) model of explicit incentives

Hart's (1983) model of managerial incentives provides an explicit framework of how a competitive environment can sharpen incentives for managers. Here, inefficiency has two causes. The first is that the interests of owners and managers are not completely aligned and the second is the inability of owners to monitor managers' behaviour perfectly. The focus of the model is on the information benefits of competition.

Two types of firms are assumed: entrepreneurial (E) and managerial (M). The first type is managed by the owner, while the second type is run by managers whose goals include effort minimisation. Even though the second type of firm suffers from principal-agent disparities, owners still observe the results of managerial efforts reflected in the firm's profits. Hart's model further assumes that managers are infinitely risk-averse and that in the case of a poor firm performance (a fall in profits), owners cannot identify whether the cause is mismanagement or high costs. All firms in an industry are assumed to share a common cost component.

Owners optimize their returns under these constraints by designing incentive schemes aimed at spurring managers' efforts. Because of the information asymmetry, there will be some shirking, even if the optimal managerial incentive scheme is implemented. For example, in times when costs are low, managers will be able to slack and still reach targeted profit levels.

This can be explained as follows. Since all firms share a common cost component, no firm is exempt from the effects of shocks to input costs. In good times when costs are low, entrepreneurial firms will increase output and profits. Industry supply will rise and prices will fall, thus allowing less room for slack by M-firms whose managers meet profit targets. This results in higher productivity, compared to a situation where only M-firms' costs have fallen and the industry price is unchanged. Hence, managerial incentives, the presence of E-firms and the positive correlation between firms' costs together act to reduce managerial slack.

Under Hart's assumptions, managerial slack can be eliminated completely only in an industry consisting entirely of E-firms. In this sense, the market mechanism is not an optimal incentive scheme. Nevertheless, the more significant the common component in firms' costs (i.e. the higher the correlation between firms' costs), and the larger number of E-firms in an industry, a smaller proportion of rents will be appropriated by managers in the form of shirking.

Even if owners do not have information about benchmark industry profits or other managers' performances, the industry price is a signal that interlinks the actions of different firms' managers – the market mechanism acts as an additional incentive scheme. Hart summarises this finding by noting that "competition makes the performances of different firms interdependent" (1983, p.367).

Meyer and Vickers' (1997) model of "effective incentives"

Meyer and Vickers (1997) provide an alternative model, which adds an intertemporal dimension and shows that competition sharpens the incentives for better management implicitly. In this model, the focus is on the idea that a more competitive market (a larger number of firms in a similar line of business) provides more information, which can be used for comparing the performance of managers. This allows for a more accurate assessment of managerial accomplishment, better-designed explicit incentive schemes and hence increased efficiency. In addition, managers' current performance has a bearing on their reputation and hence their future employment opportunities and expected earnings.

The model points to a three-fold impact of competition on managers' performances – through the insurance effect, reputation effect and ratchet effect. The information benefit of competition (through its provision of more points for comparison) means that contracts can be written better and enforced more effectively. Specifically, this applies to the inclusion of incentives in managerial contracts. This 'insurance effect' of competition enhances productivity.

The dynamic aspect of the model is important when managers' intertemporal incentives are considered. Managers realise that good performance in the present period will improve their reputation in the labour market and better their earnings prospects. This reputation effect is a type of implicit incentive, which is sharpened the more competitive the product market is.

The ratchet effect is in fact a disincentive to managers. For instance, if a regulated firm knows that improved efficiency (through cost cutting) leads to the regulator administering lower prices, then X-inefficiency is likely to persist.

The important contributions of this model include the observation that current performance determines not only present rewards but also the terms and explicit incentives offered in a potential future contract. Meyer and Vickers (1995) also highlight the importance and linkages between implicit and explicit incentives, which they term together "effective incentives" (p. 548).

Responsiveness of profits to the actions of managers

Other models view the connections between competition, managerial effort and productivity from a different angle.

Hermalin's (1992) overarching model

Hermalin (1992) offers a game-theoretic framework that incorporates the earlier managerial-incentives models but also adds other aspects related to the effect of

competition on the firm's agency problems – his aim is to separate the information benefit of competition from the other ways in which competition impacts on the firm's agency problems. The model also allows for comparison with earlier contributions by changing its assumptions and parameters.

The value of Hermalin's framework is that it decomposes the effect of competition on the principal-agent problems faced by the firm into three effects (akin to a Slutsky decomposition) – these are the income effect, the risk-adjustment effect and the change-in-the-relative-value-of-actions effect. In order to arrive at the decomposition, Hermalin treats the types of behaviour that benefit the manager at the shareholders' expense similarly to a commodity included in the managers' utility functions and describes these behaviours as 'agency goods'. This is the composite name for such practices as slacking, receiving perks and empire building.

The model also departs from the more common assumption that the shareholders (or 'the principal' or owner) offers a "take-it-or-leave-it" contract to the executive ('the agent' or the manager) and proposes that the opposite is more realistic – that is, the executive makes such an offer to the shareholders. This type of bargaining permits the executive to buy agency goods from shareholders and "pay" with a lower expected income.

The income effect is the first of the decomposition effects. For a given level of agency goods, the executive's pay changes on the margin with the firm's expected profit. When competition lowers the firm's expected profits, the executive's expected remuneration also falls. If agency goods are normal goods, then the executive will lower his purchases when competitive pressure on the firm rises and thus efficiency will increase.

Competition may change the executive's chosen action (quantified as the consumption of agency goods) by changing the riskiness of all available actions – this is the risk-adjustment effect. The sign of this effect is ambiguous *a priori*.

Competition can also change the relative returns to different actions in terms of expected profits. The action that was preferred by the executive before the change in competition can become relatively more or relatively less profitable when competition intensifies. Part of the reason is that, depending on the type of the firm's production function, more intense competition can increase or decrease the marginal value (in profit terms) of a reduction in costs. This is the change-in-the-relative-value-of-actions effect. Its sign is also ambiguous. This idea, although somewhat subtle, becomes important to the outcomes of models and is incorporated into later papers and discussions (for example, Schmidt (1997) and Aghion et al (2005)).

Arguments for a negative relationship

Scharfstein (1988) modifies Hart's (1983) model to show that the beneficial effects of competition on managerial incentives depend on the specification of managerial preferences. In particular, if managers are risk-neutral (in contrast to the risk-averse managers in Hart's model) and have a low responsiveness to monetary incentives, then an increase in competition in fact can result in reducing managerial incentives and productivity. Scharfstein's (1988) aim is not just to show that the conclusions derived from models of managerial incentives are sensitive to the specification of the problem and to the values of numerous parameters, but to highlight the lack of clarity regarding the nature of agency problems, such as the dynamics of the conflicting relationship between shareholders and managers.

Workers' wages and effort

Several authors point to the link between competition and the wages and effort of workers but there are few rigorous theoretical models. The intuition behind the hypothesised links is that competition determines the size of the product market rents available to the firm and both managers and workers alike expect a share of these rents. The reasons why rents are shared with workers include easing of managerial endeavour (Smirlock and Marshall, 1983) or responding to the bargaining power of strong unions (Stewart, 1990; Nickell 1999).

Without presenting a rigorous model, Holmes and Schmitz (2010) argue that there is an incentive for suppliers of monopolistic firms to acquire market power and thus capture some of the firm's rents. A number of case studies are used to illustrate. These include the inefficient loading practices enforced by unions of dock workers in New Orleans in the 19th and early 20th century, since shipping via New Orleans had few available alternatives, but the unions' bargaining power diminished and these practices changed when rail transport was introduced, making other port easier to access (Holmes and Schmitz, 2001).

Another case used by Holmes and Schmitz (2010) describes the US iron ore mines' reaction to the threat of Brazilian imports by demanding changes in the specific rules about how coal miners in the West are transported to and from their shifts and by whom and how repair jobs on machinery may be performed. The union resisted the changes, but the employers won the arbitrated dispute. This is likely to have been the main contributing factor to the doubling of the industry's labour productivity in the decade 1980 – 90 (Galdon-Sanchez and Schmitz, 2002; Schmitz, 2005).

Stewart (1990) conducts empirical tests of the hypothesis that the unionised wages will be higher in industries where product market competition is less intense, as the bargaining power of unions ensures that workers appropriate a potion of available rents, and finds that his evidence supports this. Stewart (1990) invokes Galbraith's notion of "the countervailing power of the unions" (1956) in explaining this finding.

In his discussion of the theoretical arguments, Nickell (1996) makes the link between competition, workers' wages and effort levels by arguing that workers' wages and effort levels are negotiated at the same time. Schoar (2002) explains the reduced productivity due to diversification effect, which she finds, by presenting evidence that more diversified firms pay higher wages to their employees and hence have higher costs. Schoar explains this evidence by echoing the arguments presented earlier about the firm's various stakeholders who lay claim on available rents and pointing out that workers are "one of the largest constituencies of a firm" (p. 2399).

Closer to a workhorse model

Schmidt's (1997) and Raith's (2003) models are likely to be the closest attempts to presenting a workhorse model of how a change in the competitive environment impacts within-plant productivity (Holmes and Schmitz, 2010).

Schmidt (1997) extends some of the ideas presented by Hermalin (1992) but abstracts away from the information benefits of competition and instead focuses on the other ways in which competition affects the firm's principal-agent problems. One of the important features of Schmidt's model is that it considers the increased likelihood of bankruptcy for firms operating in a more competitive environment. Specifically, Schmidt's model includes two effects. More intense product-market competition firstly increases the probability of the firm being liquidated and the secondly, as in previous work, it reduces expected profits.

The end result of the two effects is ambiguous. The "threat-of-liquidation" effect definitely works to increase the manager's efforts in order to avoid the disutility of being unemployed for a period or having to search for other work opportunities and also the damage to his reputation. But there is also an indirect effect – the rise in the probability of bankruptcy makes it cheaper for the owner to induce a higher level of effort through incentives.

However, the direction of the second effect is unclear. Competition lowers the expected profits of the firm and this leads to the "value-of-a-cost-reduction" effect (this is akin to Hermalin's (1992) third effect). If increased competition means that the marginal impact of a decrease in costs on profit falls, the owner is less likely to offer the manager a high payment in order to induce effort. Hence, if this effect is negative and it prevails, a rise in competitive pressure may lower managerial effort and firm efficiency.

Raith (2003), like Schmidt (1997), steers away from an explicit consideration of the information benefits of competition, but takes a different approach. His model incorporates a market structure that is endogenously determined and assigns importance to the sources of competitive pressure, which differ in the way they impact efficiency.

The model uses a framework that resembles monopolistic competition as the products can be differentiated to various degrees and the assumption of free entry (in the regulatory sense, though not necessarily costless) is a key driver of the conclusions. New circumstances in the competitive environment can be reflected in a greater substitutability of goods, which results in an overall fall in prices. Competitive pressure also rises when the market size increases or the cost of entry falls, as these factors encourage entry by new firms and result in a fall in prices.

Raith (2003) demonstrates that the effects of these factors differ, depending on whether the market structure is fixed or determined within the model. If a fixed number of firms is assumed, then a greater substitutability of products has two effects. One of these is a *business-stealing effect*, as every firm's individual demand curve becomes more elastic. Lower-cost producers attract customers away from their rivals more easily. Thus, the business-stealing effect increases the marginal benefit which a firm receives from lowering its costs. This heightens managerial incentives and efficiency.

The second effect is a *scale effect*, which implies that increased competition makes it more likely for a firm to lose market share and to derive fewer benefits from within-firm cost reductions, thus lowering incentives. In this context, the total effect is ambiguous.

However, allowing for market structure to be determined within the model eliminates this ambiguity (by changing the direction of the scale effect) and raises efficiency. Greater product substitutability lowers prices and profits, which induces some higher-cost firms to exit until expected profits for the remaining firms return to zero. The surviving firms each have a larger market share and thus have a higher incentive to lower costs.

Therefore, in Raith's model, whether the rise in competitive pressure leaves surviving firms with a greater market share matters. As with changes in product substitutability, the influence of changes in the market size or the cost of entry on managerial incentives hinges on this. If the market expands, attracting new firms, but still leaves each producer with a larger share, then managerial incentives are heightened. If the cost of entry falls, ceteris paribus, new entrants reduce each firm's share of industry output and lower managerial incentives.

Further, Raith incorporates a more robust notion of the relationship between risk and incentives. Competition increases the elasticity of each firm's individual demand function and also changes its level of output, thus widening the variance of profits. The latter rises when products become closer substitutes and when the market size expands, but decreases when entry becomes cheaper. Hence, there is no direct influence between firm risk and managerial incentives, but the model shows that the riskiness of profits changes in the same direction as managerial incentives. Raith distinguishes between this notion of risk, faced by the firm, and the risk faced by a manager. When the manager's performance is measured in terms of the firm's level of costs, his focus would be on the variability of the firm's costs. Incentives are negatively related to the variability of the firm's costs and positively related to the firm's risk. This distinction allows for more

accurate definitions of risk and for the design of better measures of their impact on incentives.

Incentives for research and development

Yet another set of models shift focus considerably to look at the role of competition in determining incentives for innovation. While there is no clear consensus on type and dynamics of this theoretical relationship, Schumpeter's (1942) view is often the starting point. Different authors offer varying statements of Schumpeter's hypothesis but in its essence is the claim that a monopoly power spurs innovation.

Geroski (1990) offers a summary of the main theoretical arguments about the effect of market power on innovation. This relationship is somewhat more complex than the Schumpeterian hypothesis stated above and involves considering both current and anticipated market power. For simplicity, the arguments will be presented using the extreme case of monopoly, but this should not detract from their generality. Geroski identifies two effects that have dominated theoretical propositions. The direct effect has to do with how monopolies respond to the possibility of post-innovation rents of a given size. The indirect effect is that monopoly power influences the size of the post-innovation rents.

There are claims that the direct effect can be positive or negative. The arguments supporting a positive effect centre on the material advantages of monopoly. Its current porifts and the stability of anticipated market power provide resources for undertaking R&D activities.

The opponents of this argument bring three reasons in support of a negative effect. First, the absence of competitive pressure and hence an opportunity for managers to appropriate part of monopoly rents in the form of slack, thus allowing for X-inefficiency. Of course, this is too simplistic, as the owners of both monopolistic and competitive firms have the same incentives to maximise profits – but this part of the argument has been discussed in some detail above. The second reason, sometimes referred to as the sampling advantage of competition, is that if more firms are striving to find new methods of lowering costs within a fixed period, either as a result of more participants in the research activity or because the activity id more intense, it is more likely that at least one of them will be successful. The third reason hinges on the fact that monopoly would be less willing to incur the costs of replacing the old technology than competitive firms or entrant firms would be.

If the monopoly anticipates retaining its position, then the indirect effect is likely to be positive. A dominant firm is seen likely to appropriate a greater innovation rent. However, the direct effect could be positive or negative. Geroski (1990) accepts the ambiguity and embarks on assessing this empirically. He finds that the direct effect is negative and the indirect effect is small, which amounts to "almost no support in the data for popular Schumpeterian assertions about the role of actual monopoly in stimulating

progressiveness" (p. 600). Geroski also highlights that technological opportunity (i.e. the degree of difficulty in engaging in innovative activities, which may include the extent of spillovers and overlap between different firm's R&D activities) may be a more important determinant of the level of innovative activity in an industry than the intensity of competition.

Aghion et al (2005) present a mathematical model, which proposes that the relationship between market power and innovation has an inverted U-shape. This shape results from the relative balance of two effects – the *Schumpeterian effect* and the *escape-competition effect*.

The Schumpeterian effect, as mentioned above, is the claim that competition has a negative impact on the rents of potential innovators and thus it implies a negative relationship between the intensity of competition and innovation activity. The escape-competition effect is the idea that competition may increase the incremental profits from innovation and it implies a positive relationship.

Aghion et al (2005) take the analysis further by considering the within-industry firm differences in technology and identify two kinds of industries – those in which there is a technological industry leader and the rest of the firms are laggards and those where all firms are roughly at the same level of technological advancement and firms are in a neck-and-neck innovation race.

The model postulates that the Schumpeterian effect is likely to dominate in industries with leaders and laggards, where the latter are firms with low initial profits who will engage in more R&D activities. This is because the expected marginal benefit of innovation in terms of higher profits will be higher for these firms than for the leader. In contrast, the escape-competition effect is likely to dominate in neck-and-neck sectors. This is because more intense rivalry raises the incremental profits from innovation, which is likely ease the competitive pressure on successful firms.

Aghion et al (2005) find that the escape-competition effect is more important in industries with low concentration where incumbents usually produce using similar technologies (neck-and-neck sectors). Thus, at low level of competition, the relationship between rivalry and innovation is positive.

In more competitive industries, where there is likely to be a technological leader, further increases in competition are likely to lower the incentives for increased R&D. Here the Schumpeterian effect is likely to dominate. Hence the effect of competition on innovation is not uniform but depends on the within-industry technological differences between firms and the initial level of competition in the industry.

3. 'Taxonomy' of channels through which competition affects productivity, empirical methods and evidence

In this section the 'taxonomy' proposed by Holmes and Schmitz is used as a framework to review some of the empirical evidence about the relationship between competition and productivity. The authors propose that the influences run through three channels.

First, the reallocation effect (referred to as the 'between-firm effect' by Nickel (1996) or external restructuring by Disney et al (2003)) describes the redistribution of output from less efficient to more efficient firms or plants. This results form inefficient competitors exiting industries or from firms closing underperforming plants. While Holmes and Schmitz (2010) find on the basis of considering several US industry case studies that this effect tends to be small, Disney et al (2003) estimate that for a panel of UK firms in the period 1980-92, the reallocation effect "accounted for 50% of establishment labour productivity growth and 80-90% of establishment TFP growth" (p. 667).

Second, the scale effect is illustrated with a market where firms are assumed to have the same marginal cost but there is a cost of entry. If a firm can obtain a larger market share, it is able to spread the fixed cost of entry over a larger number of units, lowering average costs. This model is related to the literature on excessive entry of firms (e.g. Mankiw and Whinston, 1986). Entry beyond a certain critical level causes socially wasteful spending on (often sunk) entry costs.

Third, the X-inefficiency (within-firm effect) reflects the internal restructuring of firms to improve efficiency. Holmes and Schmitz (2010) deem this effect to be responsible for the majority of improvements in productivity when competitive pressure is intensified. Nickell's (1996) empirical analysis deals only with this effect and he explores the impact of competition on productivity levels and growth. Using an unbalanced panel of 670 UK firms in the period 1972-86, he finds that market power (expressed as market share) reduces productivity levels. This applies to both labour productivity and TFP. Moreover, intensifying competition (measured by increased numbers of rivals or by reduced rent levels) is linked to higher rates of TFP growth. According to Disney et al (2003) who consider both the within-firm and between-firm effects, the within-firm effect is responsible for the remainder of productivity improvements after the reallocation effect (i.e. 50% of labour productivity growth and 10-20% of TFP growth).

4. Substitutes for competitive pressure and other coping strategies for firms

Financial market pressure and shareholder control

Nickell et al (1997) find evidence that not only product market competition, but also financial market pressure and shareholder control lead to productivity improvements. The authors propose that the latter two can be thought of as substitutes for competitive pressures from firm rivals. Using a panel of 580 UK manufacturing companies, Nickell et al find that their inverse measure of competition (average rents normalised on value added) is negatively related to total factor productivity growth. In addition, their proxy for financial market pressure by lending institutions (interest payments normalised on cash flow) has a positive impact on future productivity growth and stronger shareholder

control (represented by firms with a dominant shareholder) also improved productivity but this influence is the strongest when the dominant shareholder is from the financial sector. In the presence of financial pressure or strong shareholder control, the effect of competition on productivity weakens, showing that the former two factors can substitute for competitive forces in increasing efficiency.

Changes in corporate control – sell offs and takeovers as other coping strategies

Even though the authors do not explore this explicitly, the paper by Maksimovic and Phillips (2001) can be interpreted to raise the issue of further knock-on effects of productivity improvements on firm's growth strategies or, alternatively, of circular causality between competition and productivity. The authors estimate unbalanced panel probit regressions in search of the determinants of the probability that an asset is sold. An important result is that assets, which changed ownership, had low productivity before the sale and improved their productivity afterwards.

The probit regressions in Maksimovic and Phillips (2001) indicate that for firms operating in multiple industries, the likelihood of a division being sold is lower if the division's or the industry's productivity increases. With regard to single-division firms, if the selling firm is less productive and if the industry experiences a positive shock to demand, the probability of mergers and firm sell-offs increases.

The firm's productivity experience in all its divisions determines its decision to sell a particular plant. The less sanguine the outlook for a plant (and its respective industry) relative to the firm's involvement in other industries, the more likely it is for this plant to be spun-off. This result puts forward an interesting link between the productivity performances of different industries.

Maksimovic and Phillips (2001) also find that more productive multi-segment firms are less likely to be sellers and more likely to be buyers of additional plants. In other words, less productive firms tend to attempt to improve their efficiency by selling low-productivity assets to their more adept counterparts, which may be more capable of turning underperforming plants around.

Schoar's (2002) results can be thought of as the idea that corporate diversification can be used to reduce the effects of competitive pressure that a firm experiences in a particular industry, but the price to pay is a decrease in the firm's overall productivity. Schoar shows that while conglomerate firms have higher total factor productivity (TFP) *levels* at any particular time, acquiring an asset in a different industry lowers the productivity of the firm's incumbent plants and increases the productivity of that asset. However, the reduced efficiency of the conglomerate's incumbent plants is the dominant effect.

Schoar (2002) proposes a 'new toy' effect as an underlying explanation of how a diversifying acquisition or merger affects the internal workings of a firm. Management's focus turns to new assets and improves their performance, but existing plants suffer from

being neglected. Schoar's view that "diversified firms are not bad per se, but diversification is a bad corporate strategy" (p. 2401) is valid from the point of view of the shareholder. However, an alternative explanation for why firms embark on diversification is a kind of an "escape-competition-through-diversification-effect", which lowers the overall probability of bankruptcy for the firm and likely allows it to focus more on growth areas represented by new assets as reflected in the improved productivity of those.

5. The South African evidence

Studies about South Africa are few, limited by the dearth of available data. The results of the most directly relevant study by Aghion, Braun and Fedderke (2008) and some further evidence from trade liberalisation studies by Edwards (2001) and Edwards and Van De Winkel (2005) will be reviewed in this section. Harding and Rattso (2005) stress the importance of innovation in spurring productivity, and specifically the role of spillovers due to South Africa's lowering barriers to technological influence with the advent of democracy in the 1990s.

Aghion et al (2008) estimate the competition-productivity relationship for South Africa and provide international comparisons. The descriptive statistics produced from their firm-level dataset (from Worldscope) indicate that there trend in the average mark-up ($\mu = \frac{P}{MC}$) for South African firms is non-declining over the period 1970 – 2004. In fact there is an increasing trend at the end of the period (specifically from 1995 to 2004).

Price-cost margins are defined as the ratio of value added to output at industry level and the ratio of operating income to sales for listed firms, in this case. The upward trend in industry price-cost margins (obtained using an industry-level dataset from UNIDO) confirms the decline in the intensity of competition for South African industries.

Using other indicators of rents, such as the Net Income : Sales, Net Income : Assets, and Net Income : Equity ratios, Aghion et al (2008) find that South African firms enjoy 50% higher profitability than their international counterparts. These results retain their robustness when controlling for total and per capita GDP in the comparisons with 60 countries.

The results of panel data regressions used to estimate the impact of price-cost margins on productivity growth show a negative and significant relationship. The impact is also sizeable. Considering firms from 115 countries, including South Africa, from the Worldscope dataset, a 10% increase in the price-cost margins from the median of 0.24 causes a decrease in productivity growth of 2.4% per year. This means a typical industry would reduce its productivity growth from the median 2.6% to a meagre 0.2%. For South Africa alone, a 10% increase in the price-cost margins results in a decline on productivity growth of 1.6% per year, which implies that a typical South African industry's productivity growth would drop from the median of 1% to (– 0.6%) per year.

Edwards (2001) finds that the increased role of trade in the South African economic landscape, together with the impact of various policies, has shifted net trade away from sectors with substantial labour intensity and towards more capital-intensive sectors. This is consistent with Harding and Rattso's (2005) findings below, as South Africa's increased openness has increased its incentives to catch-up to the world technology frontier. The increased capital intensity and the resulting shift towards the employment of more skilled labour implies rises in both labour productivity and total factor productivity.

Edwards and Van De Winkel (2005) find that South Africa's increased openness to trade and lowering of tariffs since 1994 has increased import penetration and reduced mark-ups. Their findings are that "mark-ups rise for all broadly defined sectors during the late 1980s and early 1990s, which appear to coincide with the implementation of surcharges during this period. Average mark-ups in mining and manufacturing then fall if intermediate inputs are excluded, but remain constant if intermediate inputs are accounted for. Mark-ups in the services sector rise if intermediate inputs are excluded, but remain constant if intermediate inputs are included" (p. 45).

Edwards' and Van De Winkel's (2005) evidence for the market disciplining effects of trade liberalisation reveals that the effect is most prominent during the period 1995-2002 when a 1%-reduction in tariffs is estimated to lower the average mark-ups in manufacturing by approximately two percentage points. Hence trade liberalisation as a source of competitive pressure has proved effective in lowering mark-ups, which is consistent with the case-study evidence for other countries reviewed by Holmes and Schmitz (2010).

Harding and Rattso (2005) adopt a developmental approach and use a barrier model to estimate South Africa's productivity growth using a panel of 28 manufacturing sectors over the period 1970 – 2003. The idea behind the model is that country-specific barriers to adopting new technology timeously influence productivity growth and hence economic growth. The model suggests long-run relationship between country productivity and thye world technological frontier. Harding and Rattso (2005) use standard openness to trade measures (e.g. tariff levels) as a proxies for barriers to technological spillovers and find that the improvements in productivity during the 1990s and 2000s can be explained by the reduction in trade barriers and the increased benefits of international technological spillovers to local industry.

5. Complications

Definitional and measurement problems

The literature on the link between competition and efficiency is misaligned about the precise meaning of competition, often implicitly or unintentionally. For example, Nickell (1996, p.725) considers the present level of rents: "I take an industry to be more competitive if there are fewer monopoly rents". However, the availability of potential rents or the expectation of an uninterrupted future stream of rents is likely to be both

important in assessing market power and difficult to measure. What about the growth in rents?

In their discussion of relative performance measures, Nalebuff and Stiglitz (1983) present a view of competition that is more akin to a sports tournament, where the winner is awarded a prize and the loser(s) either receive either smaller rewards or have to suffer penalties. This is a more dynamic view of an environment that is probably subject to agents' jostling for position, which is the force behind competitive pressure, compared to the static idea of price competition embodied in the orthodox neoclassical models.

Acknowledging the difficulty in choosing an accurate and representative market power variable, Geroski's (1990) includes six measures of rivalry in his cross-sectional model: market penetration by entrant firms; the market share of imports; the relative number of small firms (with less than 99 employees); the percentage change in concentration during the period of the study; the market share of exiting firms and the five-firm market concentration ratio (p. 591).

What are productivity and efficiency? The theoretical models of managerial incentives considered here determine the level of effort exerted by managers and either assume that this will improve productive efficiency automatically or link increased effort mathematically with lower production costs. In other words, these theories determine the level of productive efficiency. The models linking competition to productivity more specifically via innovation are concerned with dynamic efficiency.

Empirical studies attempt to take some of these complexities into account. Most choose total factor productivity (TFP) as the preferred measure of efficiency. For example, Nickell (1996) deals with this complication by estimating the effects of the level of competition on the level of TFP and the impact of a change in the competitive environment of a firm of the growth in TFP. Disney et al (2003) consider both labour productivity and TFP.

Each approach contributes in some way to the understanding of the relationship but there are no precise definitions or measures of competition and productivity.

Circular causality

The endogeneity of market structure and hence competitive pressure in the competition-productivity relationship is widely acknowledged – for example Nickell (1996, p.725) recognises that "the degree of competition is not, in the long run, independent of company behaviour". This thought in a sense echoes Demsetz' (1973) critique of the structure-conduct-performance paradigm in industrial economics. Raith's (2003) model is one of the few (possibly even unique) in incorporating the endogeneity explicitly into theoretical understanding. However, it appears that the validity of the model has not been tested empirically to date.

Aghion et al (2005) highlight the endogeneity problem between innovation and competition explicitly and use major policy reforms in the UK as instruments for industry-level competition. Their instruments are the Thatcher-era privatisations, the EU Single Market Programme and Monopoly and Merger Commission investigations that gave rise to structural or behavioural measures being implemented on the industry.

Aghion et al (2008) note that their computed price-cost margins may be partially caused by shocks to productivity growth and hence their results may be due to a spurious correlation. They instrument using industry import penetration but this turns out to be an unsatisfactory instrument. Other attempt to use proxies for competitive pressure such as the opening of the economy to trade, degree of tradability per industry and the level of tariffs were also unsuccessful. Nevertheless, these attempts are informative in themselves, showing that the relationships of these proxies to price-cost margins are weak.

Nickell et al (1997) note that reverse causality is likely to be present in their results, in particular, high productivity growth would result in the firm acquiring market power and would imply the absence of financial pressure. There is no clarity about the factors, which determine shareholder control, but it appears that in the long terms, productivity improvements could assist the firm in achieving market dominance and this may draw the attention of a dominant shareholder.

Holmes and Schmitz (2010) lament that the endogeneity consideration is often mentioned, but it is nevertheless inadequately addressed in empirical estimation. Their critique of the results in Ahion et al (2005) is that, despite instrumentation, "all of the individual effects of these policies are buried under the hood of a first stage estimate, with all effects in the end forced to run through the price-cost margin" (p.14). In addition to their concern about the endogeneity of price-cost margins, Holmes and Schmitz emphasise that this variable is may not be an accurate or even satisfactory indicator of changes in competition. Hence, they choose to focus their attention exclusively on industry case studies.

Is there a relationship between firm size and efficiency / productivity (for a given level of competition)?

Holmes and Schmitz (2010) allude to this notion by considering the scale effect and putting forward the example of Wal-Mart's entry into US urban markets. The entry of a large firm into a competitive market may cause the exit of less efficient small firms. This situation reflects an increase in competitive pressure in an industry but it is likely to appear to be the opposite if for example, concentration ratios are considered in empirical work. But other key questions are: how common is it for large efficient giants to exist? Is this only to do with the scale effect?

7. Conclusion

A substantive body of literature dealing with the link between competition and productivity now exists, but it may have unearthed more questions than it has answered. Theoretical arguments about whether the impact of competitive pressure on efficiency is positive or negative remain ambiguous. Empirical evidence points largely to increased firm rivalry raising productive and dynamic efficiency but the relationship may be non-linear, as the inverted-U relationship between competition and innovation found by Aghion et al (2005). Also, there are factors which can substitute for the effect of competitive pressure, such as financial pressure and shareholder control (Nickell et al, 1997).

Further investigation into the linkages between different industries in firms' responses to productivity and demand shocks and in firms dealing with differences in relative efficiencies by embarking on spin-offs, acquisitions and diversifications, will enrich the dialogue on the productivity-efficiency linkages topic. Deeper understanding of the notions and dynamics of the competitive process between producers and the exact nature and practical resolutions to agency problems in firms are likely to continue to be subjects of future enquiry. In addition, a number of measurement and endogeneity issues have not yet been met with generally- accepted solutions.

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