Chapter 2

Competition, innovation and growth: theory, evidence and policy challenges[1]

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Product market competition is essential to the growth process but how much it affects innovation depends upon how technologically competitive the incumbent firm is. What are the guiding principles for pro-competition policies to spur growth?

- Conventional wisdom: competition exerts downward pressure on costs, reduces slack, provides incentives for efficient organisation of production.

- The Schumpeterian alternative: the only effective form of competition is innovation; antitrust measures reduce the reward to innovation.

- Rethinking Schumpeterian theory – an inverted U.

- Policy lessons from the ABHV model.

- Six principles for promoting competition in developing countries.

Conclusion: as you approach the frontier, appropriate policy changes.

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Introduction

How is a country's growth rate affected by competition policies? The conventional wisdom on this subject, as expressed for example in the Spence report (World Bank, 2008), is that competition exerts downward pressure on costs, reduces slack, and provides incentives for efficient organisation of production, thereby favouring economic growth. An alternative view, sometimes ascribed to Schumpeter, claims the opposite – that rigorous pursuit of antitrust policies is detrimental to growth because anything that reduces the scope for monopoly profit also reduces the reward to innovation, which in turn is the mainspring of long-run growth.

For more than two decades now I have been working, together with my colleague Philippe Aghion, to develop and test a version of growth theory based on Schumpeter's idea of creative destruction (Aghion and Howitt, 1992, 1998, 2009). My purpose in this lecture is to describe what we have learned from this investigation about the effects of competition on growth and innovation. As it turns out, theory and evidence do not provide unequivocal support for either the conventional wisdom or the alternative "Schumpeterian" view.

Schumpeterian growth theory

Schumpeterian theory starts from the same premise as almost every other growth theory, namely that long-run growth is driven by productivity growth, which in turn is driven by technological progress. It differs from neoclassical theory by treating technological progress as an economic phenomenon. And it differs from other endogenous growth theories in emphasising that the main force driving technological progress is industrial innovation, the same force that is central to the competitive process of any market economy.

The theory also emphasises that successful technology strategies vary from country to country, depending on such factors as institutions, geography, educational levels, environmental conditions, and especially distance to the world technology frontier. Countries that are on or near the frontier tend to produce leading-edge innovations, whereas countries that are further from the frontier tend to implement technologies that have been developed elsewhere. It thus produces a context-dependent theory of what we call "appropriate growth policy" (Aghion and Howitt, 2006).

The earliest version of this theory seemed to vindicate the Schumpeterian view of competition and growth; increased competition that reduced monopoly profits did indeed reduce growth by reducing the reward to successful innovation. It did not take us long, however, to recognise that this particular implication of the theory is contradicted by several empirical studies. Porter (1990) observed that Japanese firms in more competitive prefectures tended to grow more rapidly, and econometric work on UK manufacturing firms by Blundell *et al.* (1995) and by Nickell (1996) showed that a linear regression of either productivity growth or the frequency of patenting on various determinants, including an industry-specific measure of the degree of competition, indicated that firms are more innovative, and productivity grows more rapidly, in industries that are more competitive, other things equal.

More generally, many economic historians have come to the conclusion (for example Crafts, 1996) that rapid growth is associated with openness and competition in product markets rather than with protected monopolies. And of course the "modern miracle"

growth countries of East Asia have all had export-oriented policies under which firms were forced to submit to competitive market pressures. Even Korea, with its *chaebol* and its import restrictions, has made successful competition in foreign markets a necessary condition for support and for permission to import key inputs.

In the face of this evidence it was clear that we had to modify the first generation models of Schumpeterian growth theory to include some of the mechanisms by which competition spurs growth, mechanisms that would, at least in some circumstances, counteract the Schumpeterian appropriability effect.

Ex ante barriers to entry

Introducing *ex ante* barriers to entry is one such modification. A policy of strengthening competition by removing barriers will allow more potential innovators to be active. This obviously should raise an economy's overall rate of innovation. These barriers to entry, as measured by the cost of starting a business, can be quite substantial; they vary greatly across countries and are highly negatively correlated with a country's level of development. Table 2.1 shows, for example, that to start a business in India requires the entrant to undertake ten procedures and is estimated to take a total of 77 days and to require an expenditure equal to 58% of Indian per capita income. The table indicates that these costs are significantly higher in BRIC countries (Brazil, the Russian Federation, India and China) than in the average country in the top quartile of the world distribution of per capita income, by enough to constitute significant barriers to entry and to help explain why the BRICs remain poorer than the top quartile.

Table 2.1. Entry barriers in select countries

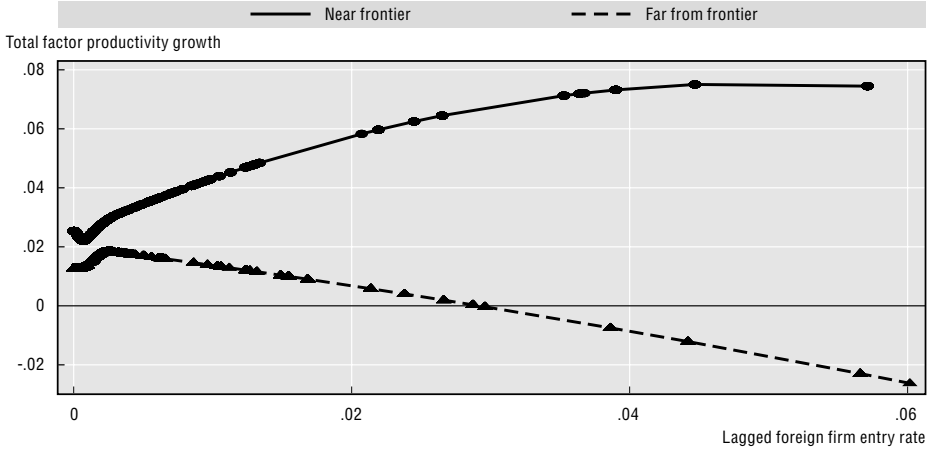
	Procedures	Time	Cost
Brazil	15	63	20%
Russia	20	57	20%
India	10	77	58%
China	12	92	14%
Richest quartile	7	24	10%

Source: Djankov, S., R. La Porta, F.Lopez-de-Silanes, and A. Shleifer (2002). "The regulation of entry", *Quarterly Journal of Economics*, Vol. 117, pp. 1-37.

Incorporating entry barriers into the theory shows however that effects on innovation can be mixed. On the one hand, the new entrants will bring new possibilities for innovation; on the other hand, established firms might be discouraged from undertaking R&D projects for fear that an entrant will arrive with such an advanced technology that the firm is driven out of business anyway. The theory suggests that the threat of foreign entry by firms on the world technology frontier will indeed discourage R&D by domestic firms that are far from the frontier to begin with but that it will encourage R&D by domestic firms that are close to the frontier; they will realise that the best defense against a frontier entrant is to get onto the frontier themselves.

Figure 2.1 shows that this theoretical prediction seems to be borne out by UK manufacturing data. Both curves show a partial non-linear regression of domestic UK establishment productivity growth on lagged foreign entry in the establishment's industry over the period 1987-93. The upper curve shows the regression curve when the sample is restricted to observations in which the industry's distance to the frontier (as measured by productivity relative to US productivity in the same industry) is above the median for the whole sample, while the lower line shows the regression for observations below the median distance to the frontier. It is clear that domestic establishments in industries that are closer to the frontier tend to have faster productivity growth when there has been a lot of entry recently while the reverse is true for establishments in industries that are further from the frontier.

Figure 2.1. Entry, incumbent TFP growth and distance to frontier, 1987-93



Source: Aghion, P., R. Blundell, R. Griffith, P. Howitt and S. Prantl (2009), "The Effects of Entry on Incumbent Innovation and Productivity", *Review of Economics and Statistics*, 91, forthcoming.

One of the questions that this conference will be addressing is the extent to which competition might help to spur innovation in fast-growing middle-income countries (BRICs). The results of Figure 2.1 suggest that, to the extent that many of the industries in the BRICs are relatively far from the frontier, increased trade liberalization might discourage innovation on the whole. This is where the context-dependence of Schumpeterian theory helps to make sharper predictions. Specifically, the theory predicts that if combined with appropriate labour market regulations which allow firms to respond adequately, the threat of foreign entry might even act as a spur to domestic innovation in the relatively more advanced sectors of the middle-income countries. Indeed, this is what Aghion *et al.* (2006) found when exploring the effects of delicensing in India. On the whole, delicensing had a negligible effect on domestic innovation. But in regions with pro-firm labour market regulations the effect was positive, implying that even in India it is possible to use competition as a spur to innovation in many sectors, provided that it is accompanied by appropriate regulatory reforms.

Corporate governance problems

The original versions of Schumpeterian growth theory assumed that firms were profit maximisers. When agency problems arise, however, and firms are run in the interests of managers rather than of shareholders, increased competition may lead to faster growth by reducing the slack available to managers. Aghion *et al*. (1999) provided a variant of Schumpeterian theory in which managers seeking a quiet life want to avoid the stress of innovation and therefore innovate only as much as needed to keep the firm solvent in the face of competition. In such a setting, increased competition will reduce the profit flow that would otherwise allow managers to remain solvent even when their technology has fallen far below the frontier, and thus forces them to innovate or die, to use Porter's (1990) expression. A good example of this phenomenon is provided by the US Saving and Loans industry, which until the mid-1970s was well protected by regulations and was so non-innovative that it failed to come up with the adjustable rate mortgages that protected other countries' mortgage lenders when inflation rose. It therefore found itself locked into mortgages at low rates that had to be financed by high-rate term deposits of shorter duration than the mortgages.

To the extent that corporate governance is an even bigger problem in low- and middle-income countries than in rich countries, this mechanism by which competition fosters innovation and growth is probably even more relevant for BRICs than for OECD countries. Maloney's (2002) analysis indicates that one of the most significant problems of industries that were protected from competition in Latin America under import substitution policies was that they were not innovative and fell far behind the world technology frontier.

In theory it could be argued that the positive effect of competition on growth will be reversed if managers choose to use their cash flow not to enjoy a quiet life but to build scientific empires. Bell Labs in the United States is a case in point. When AT&T was broken up, Bell Labs was reduced to a more prosaic supporting role and soon ceased to be the source of fundamental scientific and technological progress that it had been when the company had enough slack to support the basic research that led to such breakthroughs as the transistor, the laser, and even the discovery of the background cosmic radiation that confirmed the big-bang theory of the origin of the universe. However I doubt that such cases are common even in rich countries, let alone in the poor and middle-income countries that account for a small fraction of the world's fundamental research.

Escape competition and the inverted U

In principle, the incentive to innovate should depend not on the absolute level of monopoly profits that a successful innovator could earn, but on the incremental profits that would result from an innovation. This distinction between absolute and incremental profit is irrelevant for a small start-up firm whose profit would be zero in the absence of a successful innovation. But for many firms that are already producing and earning profits, a successful innovation will to some extent cannibalise existing profits, making incremental profits significantly smaller than absolute profits.

Moreover, product market competition affects incremental profits quite differently from the way it affects absolute profits. As Boone (2000) has explained in detail, more intense competition, measured in any of a variety of ways, gives a big advantage to a more productive firm, by allowing it to take better advantage of its superior technology. This can easily result in an increase in incremental profit from an innovation. Put

differently, although an increase in competition may reduce the absolute profit of a successful innovator, it will reduce even more the absolute profit of an unsuccessful innovator.

Thus firms can have an incentive to innovate in order to escape competition from rivals with superior or even identical technologies. This incentive will be larger the more competitive the environment. In the absence of strict enforcement of antitrust regulations, even firms with no technological advantage over their actual and potential rivals can make substantial profits from collusive agreements, perhaps backed up by regulatory authority that helps protect their market from intruders. But expose them to competition and they will innovate or disappear.

Aghion *et al.* (2001) developed a growth model in which all innovations are assumed to be conducted by incumbent firms whose pre-existing technology would be devalued by an innovation. In this model, the Schumpeterian appropriability effect is present in industries with a large gap between the technology leader and the laggards, but the escape competition effect is present in industries in which the firms are all at a similar technology level. At the level of the whole economy this model implies that an increase in competition will have either a monotonically increasing effect or an inverted-U effect on the pace of innovation and productivity growth.

To see how this inverted U works, consider first what happens in an economy with very weak competition. Firms in neck-and-neck industries have relatively little incentive to innovate, whereas firms that are laggards in uneven sectors have a strong incentive to catch up with the leaders and share in their collusive profits. In such an economy most industries will end up being neck-and-neck. But this is the situation in which most firms would be stimulated to innovate more rapidly if competition were more intense. Thus, starting from a low level of competition, an increase in competition is likely to result in faster economic growth.

But now consider what happens if the economy becomes extremely competitive. In this case the incentive to innovate becomes so strong in neck-and-neck industries, where no one is able to earn any rents because no one has a technological advantage, that the industry will not long remain neck-and-neck. Thus most industries would soon be in the uneven state, and the dominant effect of a further increase in competition would be to reduce the rate of economic growth.

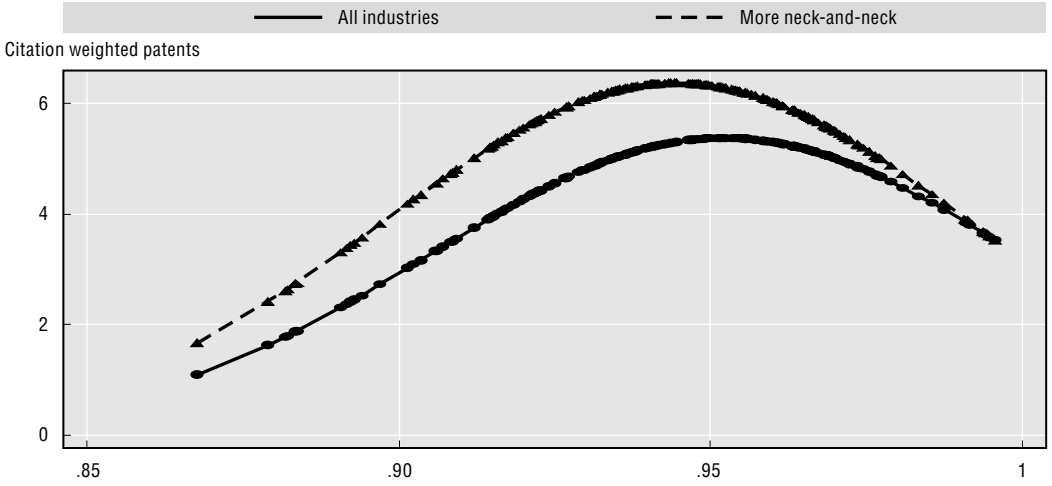
Figure 2.2 shows that, across different UK manufacturing firms, more competition (*i.e.* a reduction of the Lerner index) does indeed have an inverted-U effect on the rate of innovation, as measured by a citation-weighted patent count. Moreover, most UK firms are in the upward sloping part of the curve, where competition has a positive effect on growth. This suggests that the economy-wide effect on UK productivity growth is probably positive.

Even more than the results shown in Figure 2.1, it suggests that the economy-wide effect in most middle-income countries, where generally speaking competition is not as intense as in OECD countries, should be positive. However, one must qualify this with the realisation that to the extent that the market served by the typical BRIC is an international market and that the local firm is far behind the frontier, the dominant effect of trade liberalisation on domestic innovation may be the negative Schumpeterian effect that applies to distant laggards.

Two other important lessons come from this consideration of the escape competition effect. First, what really matters is *ex ante* competition, not *ex post*. Indeed, more *ex ante*

competition is likely to result in less *ex post* competition. That is, a small Lerner effect will intensify innovation so strongly in neck-and-neck industries that most industries will end up being dominated by the small number of firms that have survived that intense competition. Thus, somewhat paradoxically, more competitive sectors are likely to become being more highly concentrated. This is why we use a Lerner index rather than a concentration ratio as our measure of competition.

Figure 2.2. Innovation and competition: the neck and neck split



Source: Aghion, P., N. Bloom, R. Blundell, R. Griffith, R. and P. Howitt (2005), "Competition and Innovation: An Inverted U-Relationship", *Quarterly Journal of Economics*, Vol. 120, pp. 701-728.

The other lesson has to do with the interaction between competition policy and patent policy. Competition policy and patent policy are complementary, in the sense that antitrust is more effective when patent policies are relatively lax. More specifically, as Aghion *et al.* (2001) show, growth is more likely to be stimulated by more intense competition when patent laws allow laggards occasionally to catch up with the leader in their industry than when this is never possible. This is because the *ex post* concentration that results from a fiercely competitive environment can lead to a lot of satisfied leaders that see little reason to innovate and a lot of discouraged laggards that have given up. But allowing patents to lapse sooner or to be broken more easily can bring some of the latter back into the R&D-intense neck-and-neck state, at relatively little cost of discouraging innovation on the part of the neck-and-neck firms. Once again we see that what matters for economic growth is not just competition policy but the whole package of policies.

Lessons for competition policy

What are the lessons of this brief and selective tour of Schumpeterian growth theory for policy makers trying to use competition policy to promote growth in rapidly growing middle-income countries? The main lesson is the very general one that appropriate growth policy is context-dependent. What works in one country does not necessarily work in another, and even within a country what works in one industry does not necessarily work in another. In particular, distance to the frontier is a key criterion. Generally speaking, the further from the frontier a country (industry) is, the less likely it is, other things being equal, that more intense competition will promote economic growth.

Firms that are far behind their rivals technologically are more likely to be discouraged from innovating by the prospect of more intense competition than firms that are already close to the frontier.

Another closely related lesson is that we miss a lot if we think of competition policy alone rather than thinking of combinations of policies that involve a change in the competitive environment. For example we have seen that it may take more relaxed labour-market regulation or more relaxed patent laws in order for more competition to stimulate growth.

Although there is no broad-brush answer to the question of whether more competition policy promotes growth, my analysis does suggest that one should be wary of arguments that competition should be restrained, regulations maintained or trade liberalisation postponed in order to preserve innovative domestic firms. Schumpeterian growth theory provides only weak qualified support to that kind of infant-industry argument. Moreover, we must remember that in many BRICs that are in aggregate far from the world technology frontier there are individual firms and industries that are on or close to the frontier. If a more competitive general environment results in laggard industries and firms losing out to foreign competition, it will also allow success stories to be even more striking. Vigorous international competitiveness is the hallmark of the East Asian growth miracles and has the potential to allow many more countries to find the path to the frontier.

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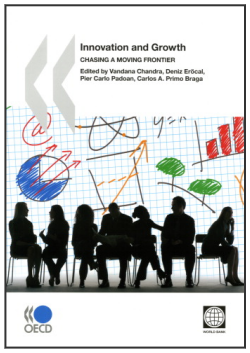

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