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***“BOTTOM OF THE PYRAMID INNOVATION” AND PRO-POOR
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Abstract

Outside of China, despite rapid economic growth in many low and middle income countries, there has been little progress in meeting the MDG1 target of halving the incidence of global poverty by 2015. Part of the explanation for this weak poverty-reducing performance has been the historic trajectory of innovation. During the 20th Century, most of global innovation had its origins in the north, producing products for high income consumers, developing technologies which excluded poor producers and technologies which were energy intensive and polluting. This innovation trajectory gave rise to the not-for-profit Appropriate Technology movement after the 1970s. But many of the technologies which they it were inefficient and were scorned by both producers and consumers. However a series of disruptive factors – the growth of low income consumers in the context of global economic slowdown, the development of radical technologies (such as mobile telephony and renewable power), the development of capabilities in low income economies and the emergence of new types of innovation actors – have begun to transform the potential of AT to support pro-poor growth. Whilst this new vintage of ATs will be largely market-driven (since it provides the potential for profitable production), there are important dimensions in which this market-driven process can be supported by policy.

1. The need for a pro-poor growth agenda

Much of the developing world experienced a “lost decade” during the 1980s, and in some cases the years of slow growth extended well into the 1990s. Thereafter, economic growth revived in many low and middle income countries. One of the consequences of this renewed growth was that the number of people living below the MDG1 benchmark (\$1.25 per day) fell from 1.8 billion in 1990 to 1.3 billion in 2008 (Chen and Ravallion, 2008). Yet, despite this progress on the growth front, the poverty numbers remain a cause for considerable concern, and it is clear that the 2015 MDG1 target (less than 900m people living below \$1.25 per day) will not be met.

This progress in reducing the number of people living below the MDG1 target was almost entirely a reflection of poverty reduction in China. In most other parts of the developing world, the absolute poverty number remained static or increased. This failure is particularly evident in India and SSA. In India, where almost half of the global sub MDG1 poor live, annual growth averaged seven percent between 2000 and 2008, yet there was no overall reduction in the absolute poverty number. In SSA, the annual growth rate increased from 2.2% (1990-1999) to 5.5% (2000-2010), yet the population living below the MDG1 threshold increased from 224m in 1988-1990 to 355m in 2007-8 (Sumner, 2010). Significantly, as Sumner observes, the bulk of the global absolutely poor do not live in countries with an average income below MDG1 (Collier’s “Bottom Billion”, Collier 2007). Three-quarters of the total live in middle income economies, many of whom benefitted from the post 1995 growth spurt.

But poverty is not just a measure of absolute living standards. It also reflects relative living standards. Moreover, there is growing evidence that inequality in itself undermines the achievement of many of the other development/MDG targets such as infant health, education and life expectancy (Wilkinson and Pickert, 2009). Here, with the exception of continental Europe and a few Latin American economies, as a general rule the intra-country distribution of income has grown markedly more unequal over the past two decades (Cornia, 2011).

The progress made by China in reducing absolute poverty in the context of rapidly-growing inequality shows the contribution which growth can make to poverty

reduction. It is clear that particularly in low income economies, meeting the MDG1 target cannot be met without either increasing and continuing financial transfers from richer economies or from sustained economic growth (or from both of these). Yet, it is also abundantly clear from the poverty numbers cited above that growth in itself will not adequately address either the absolute or relative poverty agenda. It is even possible that there is some circumstances there is a perverse outcome in which the conditions which promote rapid economic growth (for example deepening financial integration) exacerbate the problems of absolute poverty. Many pockets of the global population may thus be located in economies or regions suffering from immiserising growth.

Consequently, a focus on poverty reduction needs to go beyond the promotion of economic growth per se, to also consider the nature of growth. It is necessary to move from an “exclusive ” to an “inclusive“, prop-poor growth strategy, one in which better distributional patterns are endogenous to the growth process, and one in which the social and political constellations underpinning growth will reinforce more equal distributional outcomes.

There are a number of factors which determine the distributional outcomes of economic growth. These include globalisation which allows high income earners who possess various forms of rent (such as natural resources, skills, entrepreneurship and patents) to valorise these over a larger market. At the same time it exposes those with low incomes and without rents to intensified competition (as for example in the case of unskilled labour where the global labour pool doubled after liberalisation in China, India and the former Soviet Union after the mid-1990s). A second factor which determines the distributional outcome of growth is fiscal and welfare policy. For example, in many European economies the distribution of consumption is much less unequal than the distribution of income and In recent years some Latin American economies (such as Brazil) have also seen reduced inequality as a consequence of fiscal transfers (Cornia, 2011). A third determinant of the distributional outcome of growth is the character of innovation, which is the subject of this Discussion Paper. How does innovation affect distributional outcomes, and what policies might be adopted to improve these outcomes? Thus, whilst innovation is only a partial

contributor to the persistence of global it is an important one, and one which is largely neglected in the theorisation of innovation (Cozzens and Kaplinsky, 2009).

Insofar as innovation has contributed to adverse outcomes with regard to poverty, the first challenge is to understand how and why this has transpired. This will be considered in Sections 2, 3 and 4 below. In Section 5 we reflect on the growth of the Appropriate Technology (AT) Movement as a response to the links between innovation and exclusive growth, observing its limited carrying power in both public and private sector policies. AT is largely scorned as a suitable policy response and its diffusion has been relegated to the NGO movement. However, there are a series of disruptive forces which are emerging and which may change the prospects for pro-poor innovation. These are considered in section 6. If these disruptive forces work out in the way which is suggested this moves AT away from an NGO-driven diffusion path to a market-driven diffusion path. Nevertheless, even if this is the case, there remain important dimensions for policy support and these are briefly outlined in Section 7.

2. What do we mean by innovation?

Innovation is the process which occurs when a new idea is applied to meet the needs of a user. It may be new to a particular producer, to a particular sector, to a particular economy or to the world. The point is that it represents providing a different good or service (product innovation), or applying new methods in the production of a good or service (process innovation) or a combination of the two, that is a change in product and in process. Seen in this light an innovation represents a change in technology. As the knowledge-content in production has increased, and as global value chains have continued to fracture (Kaplinsky and Morris, 2001, Gereffi, Humphrey and Sturgeon, 2005), so technological change has become increasingly intangible, that is affecting the configuration of production systems as much as physical products and equipment. In the parlance of the value chain framework, innovation can be classed into four categories - product innovation, process innovation, functional innovation (changing business models and the division of labour within a value chain) and chain innovation (moving from one product chain to another).

3. In what way has innovation contributed to exclusive growth?

Joseph Schumpeter, an Austrian economist writing in the 1930s, defined entrepreneurship as the act of innovation, that is the application of a new idea to meet the needs of consumers. His primary focus was on the search by entrepreneurs for new combinations which would enable them to escape – at least temporarily – from competition and thereby to earn higher profits (“entrepreneurial rents”).

With a view to developing pro-poor innovation policies, three lessons can be drawn from this Schumpeterian perspective. First, whilst a profit-driven agenda explains the bulk of innovation in the global economy, there is no intrinsic reason why innovation should always occur as a commercial activity. Social innovation – for example by national health services – is an important realm of technological change. Second, the Schumpeterian perspective highlights the role of social actors in the innovation cycle. Amongst other things, this helps us to understand that technologies are predominantly shaped by their social context rather than a result of unfolding “natural laws”. Third, as a consequence of the social context of innovation, it highlights the limits to interventions which are confined to physical technologies without addressing the social and economic context of innovation. As we will see below, these three insights have important implications for the trajectory of innovation and for pro-poor innovation policies.

Drawing on the Schumpeterian framework and value chain theory’s fourfold classification of innovation and technological change, we can see how the trajectory of innovation over the twentieth century contributed to an exclusive rather than an inclusive growth path. As a general rule the consumers whose needs have historically been targeted by the global innovation system (product innovation) have been those of the higher-income consumers located in the relatively rapidly-growing northern economies. The physical “embodied” technologies which have been developed (process innovation) have in general been increasingly large scale and have depended on reliable, high-quality and network-driven infrastructure (such as electricity grids, fixed telecoms, integrated water and sanitation systems). They have also generally been labour-saving (and within this have been increasingly reliant on skilled-labour)

and capital using. And the widespread availability of relatively cheap energy sources has meant that they have been energy intensive, and often also heavily polluting in nature. The organisation of value chains, which have become increasingly fragmented and global (functional innovation) has led to the clustering of producers in low-income economies in highly competitive niches of the value chains, often confined to simple labour-intensive assembly and subject to intense wage-competition. Moreover, meeting the needs of high income consumers in high income northern economies has also led to a situation in which value chains are increasingly standards-intensive (Kaplinsky, WB@), thereby placing barriers to entry to small-scale informal and often illiterate producers. Finally, moving to new lines of activity (chain upgrading) in an increasingly knowledge-driven economy has required a range of complex capabilities which are beyond the reach of poor producers and low income economies.

Putting these trends together we can see how the historical path of innovation has acted to exclude poor producers from production, particularly for production in global value chains, and how the needs of poor consumers have been poorly met. It is important to bear in mind two important related observations made above. First this historical trajectory of innovation has not been inevitable, and second, innovation must be seen in social context and in itself has only been a partial contributor to the exclusive growth trajectories which dominate the global economy,

4. Why has innovation been exclusive?

The theory of induced innovation provides a framework for understanding how this exclusive technological trajectory has evolved. It identifies three factors which determine the nature and trajectory of technological progress (Ruttan, 2001). The first is the nature of demand, with innovators responding to the effective demand of consumers with disposable cash incomes. The large and growing markets in the post-war era were of high-income consumers in developed economies rather than low income consumers in developing economies. The second is factor prices and the quality, nature and price of infrastructure. Innovation occurring in high income economies reflects these operating conditions and has been capital intensive, large in scale and dependent on reliable, widely-diffused and centralised infrastructure. The third factor identified by Ruttan, based on insights from institutional economics (Dosi,

1982), reflects the path-dependencies of innovating firms. Their bounded rationality means that northern-based firms innovated in areas closely related to their past success, reinforcing a trajectory of innovation which was largely focused on meeting the needs of high-income consumers and operating conditions in high-income economies. We can add to Ruttan's three-fold induced innovation framework the role of regulatory systems. An increasingly tight and enduring systems of global intellectual property rights has created major barriers to the entry to new innovators. The under-pricing of the real cost of energy and environmental externalities (a reflection of regulatory systems) has led to the development of energy-intensive and polluting innovation streams.

In reflecting this innovation trajectory we need bear in mind that until very recently the overwhelming proportion of resources which go into innovation have been in the high income economies. The Sussex Manifesto of 1970 (Singer et al, 1970) estimated that around 98% of global R&D expenditure occurred in high income economies, and much of 2% which took place in the developing world was focused on the needs of high income consumers and the formal sector. But R&D is only one source of technological change and, although unrecorded, a very large proportion of the incremental change which occurred during the process of production was similarly located in high income economies. Where incremental innovation has occurred in low income economies, much of this has been in TNCs originating in the high income economies and has been geared to meeting the routines of their global operations (Teece, Pisano and Shuen, 1997).

It is not surprising, therefore, that the dominant global innovation path has, until recently, contributed in important ways to the persistence of global poverty and to a widespread increase in global inequality. The most marked indicator of this impact has been with regard to the marginalisation of much of the global population from formal sector employment. In 2009, for the first time in human history, more than half of the global population lived in cities (UN-HABITAT, 2009). But unlike the cities of the nineteenth century and the first half of the twentieth century, these cities are peopled by the marginalised and excluded – we have created, in Davis's phrase, a "planet of slums" (Davis, 2006).

5. A response to marginalisation: the rise (and fall) of the AT movement

One response to this northern-focused innovation trajectory - which produced products for high income consumers and technologies which saved on labour, were large in scale and which depended on reliable and centralised infrastructural networks - was the development of the Appropriate Technology (AT) movement. This comprise a growing spread of NGOs, often with a global reach, such as the Intermediate Technology Development Group in the UK (ITDG, now Practical Action) and Appropriate Technology International in the USA. In spirit many of these AT NGOs drew their inspiration from the values promoted by Ghandi's Swadeshi Movement in India and promoted globally by Schumacher (Schumacher, 1973). They promoted the development of new ATs, often comprising a blending of traditional and new technologies (Bhalla, 1984) and the diffusion of existing AT,s both within and across national boundaries.

Thus, in principle, the development of AT offers the prospect of providing the underpinnings of a more inclusive and less environmentally damaging growth path. But three problems have beset the AT movement. First, empirical enquiry showed that the problem with the ATs which they disseminated, was that most were "economically inefficient" (that is, making greater use of both capital and labour per unit of output), a critique widely-recognised in the literature (Eckaus, 1955 and 1987; Stewart,1979; Bhalla, 1975; Emmanuel, 1982). Second, "appropriateness" is inherently contextual, and involves trade-offs between objectives (Kaplinsky, 1990). Many labour-intensive and small-scale technologies are relatively energy-intensive. The AT movement often failed to recognise these trade-offs and was guilty of "over-promise", undermining the credibility of the technologies it was promoting. And, third, social context of innovation was not conducive to their diffusion. The dominant innovators in the global economy were located in northern economies and had no or little interest in meeting the needs of the income-less global poor, or of incorporating the poor in global value chains.

As a consequence of these factors, the diffusion of ATs has generally been undertaken by not-for-profit NGOs such as ITDG and ATs. They have been widely scorned in

many low income countries, particularly by the urban elites who have modelled their consumption patterns and life trajectories on their peers in high income countries. The AT movement may have grown rapidly in the 1970s and early 1980s, but it was a truncated growth and it was consigned to the margins of economic growth.

6. The world is changing: forces of disruption

However, there are a series of emerging factors which threaten to disrupt the dominance of a global innovation system which target the needs of high-income consumers by utilising capital-, scale- and standards-intensive technologies which are sensitive to the quality, reliability and ubiquity of infrastructure. They offer the potential to provide ATs which are efficient and which provide poruntities for profit-seeking innovation. We will consider four of these emerging disruptive factors – the dynamism of low income markets, the availability of new radical technologies, the global diffusion of innovative capabilities, and the emergence of new innovation actors.

The dynamism of low income markets

Despite the revival of economic growth in the USA and other northern economies after the financial crisis of 2008, most of the high income markets continue to experience two structural deficits. The first is with regard to debt, where despite a narrowing of deficits in the private sector, sovereign debt remains high and continues to grow. The second, less widely recognised but equally germane to our discussion, is the level and persistence of balance of payments deficits. The structural rebalancing required to meet both of these deficits will necessarily lead to a decline in demand in high income markets (Kaplinsky and Farooki, 2011). Increasingly, and with some irony, observers refer to the likelihood of a “lost decade” in the US and parts of Europe, mirroring the experience of Latin America and Africa in the 1980s and of Japan in the 1990s. By contrast, China, India, Brazil and other emerging economies seem unlikely to suffer from the same growth trauma, and growth in these low income economies is likely to remain high and robust, at least by comparison with the northern economies. The Africa-Asia-Central Europe head of Unilever estimated in 2010 for example that, by 2020, nearly 80 percent of incremental consumption growth will come from emerging economies.

These growing low income economy markets are distinctive. On the one hand, they reflect a rapid growth in demand by an urban middle class which is not very different from most consumer markets in the north, searching for globally-branded, differentiated and high-quality positional goods. For example, in 2010 the most rapidly-growing market for Mercedes Benz and Rolls Royce cars was in China. But on the other hand, there is a rapidly-expanding and very large market of poor consumers. In particular, in both China and India, the number of households with a total income of less than \$5,000 in 2009 dominate incomes and have in many cases seen an increase in cash income and growing consumption. In 2009 they comprised 56 percent of all households in China, and 71 percent in India (<http://www.portal.euromonitor.com>). According to McKinsey calculations, the number of Indian households with an annual income between \$7,000 and \$10,000 will catapult from 14m to 200m between 2010 and 2015 (Financial Times, 5th January 2011).

In all probability, or at least by hypothesis (drawing on Ruttan's induced innovation framework), the driving of consumption by low income households will induce a different set of products compared to high-income earners in northern economies. These product innovations are likely to be differentiated to meet the environments in which they are developed. As McKinsey advises its clients, these innovations will be distinctively different from those produced for high income global consumers, somewhere between the positional goods of high income consumers and the basic functions and low acquisition cost goods of the very low income defined by Prahalad (2005) as those at the "bottom of the pyramid". It is this "bottom of the pyramid" market which has begun to draw the attention of many of the world's largest TNCs, particularly those selling final consumer goods such as Unilever, Proctor and Gamble and Nestles. Low income consumers may prefer "high quality" branded goods, but they lack the incomes required to both acquire and then consume these more expensive goods. In these circumstances they will make do with what they can afford, rather than what they would prefer to consume.

A further important reflection of the changing geography of global consumption has been the shift of final market in many sectors from high income countries to low

income countries. This has had important implications for the role of standards in global value chains. Products destined for high income consumers and countries have tended to involve the extensive use of both product and process standards. There is considerable evidence that these standards have acted to exclude low income producers from global value chains. By comparison, products destined for low income markets have been relatively devoid of standards (Kaplinsky, Terheggen and Tijaja, 2011), removing some of the barriers to entry for small scale producers. However, insofar as these standards have protected the environment and the exploitation of vulnerable labour, there has been some trade-off between the various consequences of production processes and products which affect poor producers and consumers.

The emergence of new radical technologies

The literature on long-wave cycles and innovation distinguishes a spectrum between incremental changes on the shopfloor and farm and the revolutionary heartland technologies which sweep across sectors rapidly in disruptive waves of creative destruction (Freeman and Perez, 1988). Somewhere in between these extremes are a series of radical technologies which provide the opportunity for new, higher quality and multi-functional products produced with different technologies and delivered through new business-models. Historically, synthetic textiles and nuclear power have emerged as examples of this form of radical technical progress.

In the current era, we can witness the emergence of four new technological families, each of which has widespread potential significance for producing products for poor consumers and/or for including poor producers in efficient production processes. The first of these is the rapid growth and diffusion of information and communication technologies. Perhaps the most pro-poor innovation relevant outcome has been the benefits provided by mobile telecommunications for low-cost and distributed information diffusion. Whilst most attention has been placed on their contribution to consumer welfare, it may well be that the capacity which mobile telephony provides as a capital good is of greater historical significance. Farmers and distributed producers in other sectors have greater access to market information and increasingly also to knowledge-intensive extension and business services. The second relevant emerging technology are the new forms of energy production, renewables such as solar and wind power, and biomass. Again, as in the case of mobile telephony, these

new technologies both enhance consumer welfare and provide the potential for low-cost and distributed energy supply. The distributed character of both mobile telephony and renewable energy is particularly relevant for poor consumers who were previously prevented from benefitting from these services because with previous technologies, access followed from very heavy and capital-intensive investments in infrastructure-intensive networks. By contrast, the new technologies allow access to small scale consumers and producers, particularly those living in non-urban areas. The final two sets of emerging pro-poor relevant technologies are nanotechnology and biotechnology (Singer and Daar, 2001). Both of these provide the scope for radically new technologies which have important potential applications in meeting the needs of poor people, and, small scale applications through, for example, new diagnostic kits and new water purification systems.

Each of these cases of radical technological development provide the possibility for shaping technological progress in particular directions. For example, there is no necessary reason why renewable energy should provide for distributed production. In the northern economies, the feed-in tariffs designed to promote the adoption of solar PV and other renewable forms of energy supply have led to a system in which the generated energy is fed into the national energy grid, and new energy producers do not consume the energy they produce. However, equally, these new sources of energy-production can be consumed directly at-source by producers, allowing for distributed production and use.

The global diffusion of innovative capabilities

Recent decades have seen a substantial increase in the share of global manufacturing value added in low income countries in general, and in China in particular. The global diffusion of manufacturing value added has been associated with a pervasive increase in capabilities in many low-income economies. These capabilities have been built on a number of strands of activity. The first has been the relatively passive processes of learning-by-doing, and the more active processes of “learning by adaptation” and “learning by capacity expansion” (Katz, 1987; Bell, 2007). These firm- and farm-level activities – generally associated with efforts to make maximum use of purchased, and often imported technologies – arise out of incremental changes undertaken in the operation of equipment. They are often also acquired through participation in global

value chains (Kaplinsky and Morris, 2001; Gereffi, Humphrey and Sturgeon, 2005). Formally-constituted R&D is another important component of innovation (although often overestimated in importance), By 2000, more than one-fifth of global R&D was located in the developing world (Hollanders and Soete, 2010), an increase of major significance given the estimated share in 1970 of only 2% (Singer et al, 1970). An increasing share of this dispersed R&D occurs as a result of outsourcing by global TNCs, particularly to China and India (Bruche, 2009). This global diffusion of capabilities to countries with large populations of low-income consumers provides the scope for a new source of innovation, potentially disruptive to the historic dominance of northern sourced technological change.

Disruptive entrepreneurs

However, the existence of capabilities, the availability of radically new technologies and the growth of effective demand from poor people do not in themselves result in innovation. Instead, as Schumpeter highlighted, innovations arise as a consequence of purposive action by entrepreneurs developing and utilising inventions in product, process and organisation in the search for super-normal profit.

We can distinguish a number of different categories of entrepreneurs who might play a role in the innovation of pro-poor products and services and process technologies. One key set of actors are the established global TNCs seeking to capture the “fortune at the bottom of the pyramid”, particularly in the FMCG (fast-moving-consumer-goods) sectors, but also in medical instruments (where General Electric is increasingly using India and China as sources of low-cost innovation, Immelt et. al, 2009). Prahalad, was one of the first to spot the potential which the growth which these low income markets offered for profitable production and drew attention to the market potential of this new class of consumers (Prahalad and Hammond, 2002). He observed that there were four billion people living at per capita incomes below £2,000 p.a.. He described their growing consumption power as comprising a “fortune at the bottom of the pyramid”. Crucially, and perhaps not surprisingly given that he worked in northern business schools, Prahalad believed that this provided a profitable market opportunity for transnational corporations (TNCs) rather than for the small-scale and locally-owned firms long identified in the appropriate technology and informal sector literature as being key providers for low income consumers. He argued that “[b]y

stimulating commerce and development at the bottom of the economic pyramid, [northern-based] MNCs could radically improve the lives of billions of people... Achieving this goal does not require multinationals to spearhead global social development initiatives for charitable purposes. They need only act in their own self interest, for there are enormous business benefits to be gained by entering developing markets” (Prahalad and Hammond, 2002: 4).

But this belief that northern TNCs would be able to grasp this market is an untested assertion. As Christenson’s widely-cited work has pointed out, large firms which dominate industries are often extremely good at hearing the demands of their existing customers, but very poor at hearing those of new customers. His argument is essentially that these weakness arise directly as a consequence of their core strengths which is that they invested considerable resources in acutely understanding the needs of their core customers. Thus when a new technology arrives which fails to address these known needs effectively, the major innovating firms are dismissive. For example, IBM neglected the arrival of the 51/4 floppy disc since it was hopelessly inadequate for the needs of its corporate and defence-sector customers who required vast quantities of data-storage. IBM’s problem was that it knew its existing customer base too well, but it had no feel for a new generation of much less demanding customers. As Christenson observed the previously dominant industry leaders “.....were as well-run as one could expect a firm managed by mortals to be – but that there is something about the way decisions get made in successful organisations what sows the seeds of eventual failure”. They failed precisely because they listened to their customers so well – “the logical, competent decisions of management that are critical to the success of their companies are also why they lose their positions of leadership“(Christenson, 1997: xiii).

If the leading northern-origin TNCs are unable to exploit this emerging low-income market effectively, there are a variety of domestic firms in low income economies which recognise the potential for profitability in targeting the needs of low income consumers, and addressing these needs through innovations of basic, labour-intensive technologies. A widely-cited example (which is not without its teething problems) is the Tata Nano in India, a basic car priced at less than \$2,500 and aimed at low income consumers moving up from a two-wheeled scooter. One conception of this car is also

to produce it in kit form so that consumers can tailor the body to meet their needs (adding trailers, for example) so that the car becomes a capital good. In China, Haier (which is now the world's second largest producer of white goods), discovered that some rural consumers used their washing machines both for clothes and to wash potatoes, so they redesigned their machines to make them more robust and to serve both consumer needs effectively.

Less visible, and below the radar, are a plethora of small and medium scale entrepreneurs in the south who are introducing small scale innovations without inputs of formal R&D, and with little attention being paid to intellectual property rights or product and process standards. For example, DMT Mobile Toilets is a commercial enterprise that produces, rents and maintains safe, sanitary portable toilets in West Africa. Lifeline Energy conducts extensive end-user research and then develops and distributes appropriate, clean energy products, including radios, a range of lights, solar panels and MP3-enabled Lifeplayers that allow pre-loaded educational content as well as internet access.

Another relatively new carrier of innovation are the public-private partnerships (PPPs) constructed by international organisations such as the Bill and Melinda Gates Foundation, the Global Alliance for Vaccines and Immunization (GAVI) and the International AIDS Vaccine Initiative (IAVI) to deal with global health problems. These involve building innovation consortia combining northern and southern research institutions, universities and firms. Unlike private sector entrepreneurs who seek to tap into growing bottom-of-the-pyramid cash-markets of private consumption, this PPP-entrepreneurship tends to focus on innovation in sectors where poor consumers either do not have the incomes to allow the private entrepreneurs to capture the fortune at the bottom of the pyramid, or where the public-good nature of the product and service does not allow private entrepreneurs to appropriate their innovations.

7. Promoting pro-poor innovation: market or state, and policy implications

The single most important conclusion which emerges from the above analysis is that there has been a sea-change in the determinants of pro-poor innovation. In the past

these were often inefficient in nature, were promoted by civil-society organisations and were scorned by both consumers and formal sector producers. By contrast, as a result of the disruptive factors discussed above, ATs have moved from the margin of economic accumulation. They are now increasingly efficient and a source of corporate profit. There is widespread evidence that this is occurring and that this has resulted in pro-poor outcomes. For example, in the Cameroons (Khan and Baye, 2011). Chinese motorcycles are less durable than Japanese motorcycles and require more repairs. However they cost one-third of the cost of the higher quality products and this has provided the opportunity for low income school-leavers to enter the market as taxi-drivers and logistics-providers. Similarly, Chinese-produced batteries have half the operating-life of northern-branded products, but cost only one-third as much. In both cases, the Chinese products both lower the entry-costs for purchases and reduce the unit-costs of consumption.

A recent edition of the Economist focuses on the development and diffusion of a range of pro-poor innovations in South Africa, and through South African firms in SSA:

“South Africa is being shaken up by the rise of the emerging world, as its champions invade South Africa and South African champions return the compliment. The Industrial and Commercial Bank of China brought 20% of Standard Bank in 2007, in what was the country’s biggest foreign investment. Indian conglomerates such as Tata and drugs firms such as Ranbaxy are hyperactive in South Africa. South Africa’s FirstRand is bringing its banking skills to India. SABMiller has bought one of Colombia’s largest brewers, Bavaria. This growing “south-south” trade is forcing South African companies to think about costs as never before: Tata’s trucks, which use parts made in India, are 15-20% cheaper than other locally assembled models. South Africa is littered with Chinese wholesalers selling cheap Chinese brands. And it is opening minds to the huge opportunities that lie in the emerging world.

“South African companies are paying much more attention to the rest of the continent, which some once made a habit of ignoring. MTN controls half of the Nigerian telecoms market, which is doubling in size every year. Shoprite is Africa’s largest food retailer, operating in 18 African countries. South African companies are also discovering the “bottom of the pyramid” in their own country. Several companies have pioneered the art of using cell phones to map the distribution of informal shops (spaza) and truck stops. Blue Label Telecoms, which sells pre-paid tokens, has blazed a trail in forming relationships with tribal chiefs and popular gospel singers to help sell its products. Knowledge of the bottom of the pyramid is now being used to expand in emerging markets. SABMiller produces beer for Uganda using cheap local ingredients rather than expensive imported malt. MTN provides solar-powered phones to fishermen”

The Economist, 10th September, 2011.

Beyond this diffusion of emerging country technologies in low and middle-income economies, many of the world's largest northern-based TNCs are all-too-aware of the slowdown in consumption in many high income markets and of the vibrant growth of demand in low income economies, and within these, of low-income consumers. They are reorienting their innovation systems to take advantage of the profit potential opened up by the dynamic markets of low income consumers.

So, if the market is now becoming a primary driver of ATs, what role is left for policy in the promotion of pro-poor innovation? Here we identify five clusters of policy-action which will increase the breadth and depth of diffusion of pro-poor innovation. Since the development and diffusion of efficient pro-poor ATs is a relatively recent and rapidly changing phenomenon, the policy issues which are sketched out below are embryonic and will require further development. It hardly needs mention but many of these innovation-focused policies need to complement those policies which are already in the policy armoury (such as agricultural extension, policies to promote SMEs, investment promotion agencies) and which are relevant to meeting the needs of the poor.

Removing market imperfections

All markets are characterised by imperfections of one sort or another, and much of economic policy in recent decades has been designed to weed out those imperfections which hinder growth, but which do not do so at too high a cost to the consumer, the producer or the environment. (Some measure of trade-off between growth and other objectives of development is widespread and unavoidable). The task is to identify those market imperfections which are intrinsic to pro-poor innovation.

Since poor producers and consumers are often illiterate and/or lack access to the internet and print-media they are particularly prone to knowledge-imperfections. One such imperfection arises in regard to users of innovation who lack knowledge of the nature and extent of pro-poor innovations. Mirroring this are producers of innovations who lack knowledge of final markets, particularly those which are not geographically proximate. This knowledge imperfection is especially problematic in the case of pro-

poor innovations since, by their nature, many are produced by SMEs in rural areas, unconnected to high-quality infrastructure. Consequently, for these and other reasons, many pro-poor innovations - unlike the often-branded technologies which are marketed by historically dominant northern firms - “are below the radar”. A mechanism needs to be established to fill these knowledge gaps within countries and in trade between countries. Governments in both producing and using economies are important actors, but so too are the IFIs, the UN family and global NGOs. Unlike the existing policy trajectory which seeks to connect poor producers to rich buyers, the task is now to connect poor producers to poor buyers outside of their region.

A second imperfection is the at-the-border distortions which often place relatively greater barriers to imports from low and middle income countries than they do for equivalent of products, technologies and services from traditional northern economies. Allied to this, the transport and communications infrastructure in many low income countries is disproportionately geared to the only industrial north rather than to other low and middle income countries, including those in the same region. (It is still the case that it is often easier to get from one African country to another by flying through a European metropole than by direct connections within the continent).

A third set of imperfections are those arising from inappropriate regulatory mechanisms. A systematic sweep is required of the regulatory structure to determine the extent to which these may adversely affect poor producers and poor consumers. This is not to suggest that regulations be abolished. Many regulations exist to protect the public interest. But it is important to determine whether the regulations which affect the development and diffusion of innovations are unevenly weighted against poor producers and consumers. For example, a regulation which specifies the minimum weight of a loaf of bread may either be determined by the weight of an average loaf (allowing for variable loaf-size with manual, labour intensive manufacturing) or the minimum weight of an individual loaf (favouring mechanised mixing and dividing)

Reorienting national, regional and sectoral innovation systems

Although innovations tend to be marketed by individual firms, in reality they are produced in value chains involving a series of producers of inputs. In turn, these individual producers are often connected to institutions in the national, regional and

sectoral systems of innovation such as Research and Technology Organisations (RTOs), universities, technical colleges, testing and calibration service-providers and various providers of business services, including those provided by government to support industrial and agricultural development.

Optimising the flow of pro-poor technologies therefore requires an alignment of the relevant actors in the innovation system. This recommendation slips off the tongue easily, but is a more daunting task than is often recognised. Connecting private sector firms in the innovation value chain is relatively easy and generally occurs as an outcome of market forces. But getting the supportive institutions aligned to meet the needs of poor producers and to develop products and services for poor consumers is more difficult. Often standards and curricula - let alone the direction of research - reflect connections in the system of innovation with the global community of peers rather than with the needs and capabilities of the marginalised domestic populations. This gap surface frequently in relation to the perception of quality. “fit-for-purpose quality reflects the operating environment of the user, her income and her budget. Often these only allow for the purchase and use of technically “inferior” products, as in the cases of batteries and motorcycles in the Cameroon (see above). In is also evident in the CGIAR system where the selection of problems for investigation often ignores the needs of poor and marginalised producers. For example, drawing on the successful development of Green Revolution seeds, for more than twenty years ILRAD sought to find a “high science” vaccine for trypanosomiasis. This failed, but in the interim a low-tech approach to vector control was largely ignored, and veterinary services were wound down, with severe consequences for poor livestock farmers (Clark and Smith, 2010)

Strengthening the role of non-market actors

The growing role of the market as an inducing and diffusing environment for pro-poor innovations has been a central concern in earlier discussion. However, it is a role which is inappropriate for many public goods when innovations are characterised by difficulties in appropriation and by non-exhaustability. In those circumstances, the market is unlikely to be able to serve the needs of poor consumers and poor producers. This is classically the case in the provision of health services, which are particularly important in meeting the needs of the poor. Related to this are network

problems where capital costs are high and where unit costs decline sharply with large scales of provision. This tends to occur in the case of infrastructure. It not only limits the development of networks, but creates particular difficulties when users are dispersed and have low incomes. In these cases, there will be pervasive market failure and pro-poor innovations are unlikely to emerge without the active participation of non-market actors.

This does not necessarily mean that market-actors will be excluded from participating in the development of these pro-poor innovations (although this may sometimes be the case). As we saw above, there are a number of cases of new innovation actors entering the innovation cycle in collaboration with private sector firms. They have played a particularly positive role in the provision of innovative public goods which have a direct bearing on the welfare of the very poor, such as innovations aimed at neglected diseases or diseases which disproportionately affect the poor. This has been an important development and needs to be sustained. But there has been a less active presence of non-market actors in the development and diffusion of pro-poor innovations with regard to infrastructure. The positive impact of infrastructure on poor producers is often underestimated.

Linking BOP1 And BOP2 populations

Many of the absolutely poor – that is the 1.3bn people living below the \$1/25 per day MDG target – live in close proximity with the additional 1.2 bn people living at more than \$1.25 per day but less than £2.5 per day. We can refer to these two groups as BOP1 and BOP2 respectively. BOP1 has little cash income and is unlikely to be a significant market for TNCs and other private sector actors. By contrast, the BOP2 group does have cash incomes - albeit low incomes - and represents an inducement to innovation for profit-seeking entrepreneurs. Indeed, although Prahalad did not distinguish between the BOP1 and BOP2 poor, the examples which he provides – shampoo-packaging, eye-care services etc - are more clearly aimed at BOP2 than at BOP1 consumers

There is an articulation between incomes in the BOP1 and BOP2 target groups, so that rising incomes in BOP1 may often be linked to those in BOP2. Some examples are as follows: (i) BOP1 provides cheap wage goods and services for BOP2 workers,

hence not only contributing to welfare in BOP2, but also keeping down wage rates and fostering growth (ii) BOP1 characteristically uses the detritus discarded by the BOP2 sector (iii) BOP2 consumers with cash-incomes may be important consumers for BOP1 products (iv) often BOP2 income recipients provide transfers to BOP1 relatives (v) there will be externalities in network-intensive sectors where the costs of the network are covered by meeting the needs of BOP2 and the benefits spill-over to BOP1 (vi) there is extensive evidence that because BOP2 people live above the subsistence level, they are more open to adopting riskier and innovative entrepreneurial behaviour than are their BOP1 peers, providing important role models for those in the BOP1 category (Sonnen, 2010).

Since the BOP2 poor possess incomes they are the major target for Prahalad's profit-seeking TNCs and for much market-driven pro-poor innovation. By contrast, the BOP1 poor are much less likely to provide a market for the private sector. There are two consequences which therefore arise for the stimulation of pro-poor innovation/ First, the non-market actors are more likely to play a distinctive role with regard to meeting the needs of BOP1 than BOP2 populations. Second, because of the articulation between the BOP1 and BOP2 populations, it may well be the case that those innovations which affect the very poorest segments of society are those which are targeted at meeting the needs of the BOP2 population. This conclusion fits awkwardly with some pro-poor policy agendas, just as does the recognition that meeting the MDG1 target may require a focus more on middle income countries (where 72% of the global poor live) than those countries with an average per capita income below the MDG1 target level.

Redistributing income

As we have seen, the character of the market is a major factor inducing and biasing the trajectory of innovation. Historically, the needs being met by the global innovation system have been those of high income consumers. However, in recent years, we have seen a critically important change in this inducing factor, one in which the growing market power of low income consumers has led to the development of a growing number of products and services designed to make profit out of poor consumers, and production technologies aimed at poor producers. It stands to reason, therefore, that the faster this market of poor consumers grows, and the larger this market is, the greater

will be the inducement for pro-poor innovation. We can therefore anticipate a self-reinforcing virtuous circle in which pro-poor growth stimulates pro-poor innovation which in turn reinforces pro-poor growth.

It is probable that this is the single most important factor underlying the development of a pro-poor growth path. It also makes it abundantly clear that innovation is merely one factor – albeit an important and largely neglected one – leading to a development strategy which rapidly erodes absolute and perhaps also relative poverty in the global economy.

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