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Integrating Innovation into National Development Policies in the Least Developed Countries: Strategic Priorities for Technological Catch-up

Successful developing countries have adopted policies to promote technological learning and innovation that are geared towards catch-up with more technologically advanced countries. Thus far, the least developed countries have not done likewise. However, unless they integrate technological change into their national development strategies, they will become increasingly marginalized in the global economy.

Technological progress is widely recognized as a key source of economic growth. However, UNCTAD's analysis of recent poverty reduction strategy papers (PRSPs – the main policy document in poor countries) in a sample of least developed countries (LDCs) shows a striking paradox. Although LDC Governments are concerned with promoting sustained economic growth as a basis for poverty reduction, the treatment of technological change in PRSPs is generally marginal. Such neglect of this critical issue reflects the continuation of the marginalization of technology policies within the structural adjustment programmes of the 1980s and 1990s. PRSPs, which since 2000 have replaced structural adjustment

programmes, are also plagued by inadequate attention given to the role of science, technology and innovation (STI) in the technological catch-up strategies recommended for LDCs.

LDC Governments need to elaborate development strategies that promote sustained economic growth and poverty reduction through the development of their productive capacities and the associated expansion of productive employment. Since technical change is a primary component of building productive capacities, this needs to be incorporated into development strategies and poverty reduction strategies. The PRSPs, which generally function as medium-term public expenditure frameworks, should be embedded within long-term development strategies which include the promotion of technological progress as a central element.

The two phases of catch-up

There is no blueprint for successful technological progress. Policies to promote technological learning and innovation in LDCs need to correspond to their level of technological development, economic structure and the capabilities of their Governments and business sectors. The basic strategic objective of STI policy should be the promotion of technological catch-up with more advanced countries.

In broad terms, analysts have identified two stages in the catch-up process:

1. An *early catch-up* stage, in which simple technologies are adopted in mature low-tech industries and medium-tech industries; and
2. A *late catch-up* stage, in which more complex technologies are adopted in medium- and high-tech industries.

The two stages of the catch-up process are distinguished by the complexity of the types of industries which are developing. The late catch-up stage is relevant for countries which have already established simple industries but do not operate at the world technological frontier and can no longer compete on the basis of low wages and unskilled labour.

Appropriate policies to promote technological learning and innovation differ between the early and the late stage of the catch-up process. Corresponding policy measures are required to promote the initial acquisition of foreign technology, local diffusion and upgrading.

A particularly good example of how policy should change over time during the catch-up process is provided by the Republic of Korea (see box).

Early stage catch-up: strategic priorities

LDCs are in the early stage of the process of technological catch-up, and basic human capital, physical infrastructure and domestic financial systems to support long-term pro-

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ductive investment are all very weak. Without improvement in these foundations for development, it is difficult to see how technological change will take place.

UNCTAD has identified six major strategic priorities for technological catch up in LDCs in early stages, namely:

1. Increase the absorptive capacity of the domestic knowledge system;
2. Increase agricultural productivity;
3. Promote the formation and growth of domestic business firms;
4. Foster growth linkages and production clusters;
5. Leverage more learning from international trade and foreign direct investment;
6. Upgrade export activities.

Increasing absorptive capacity

Increasing the absorptive capability of domestic knowledge systems requires three major types of policy measures:

- Education and training which increases the pool of relevant human skills: these include basic skills related to operation and maintenance of technology, business management, as well as design and engineering skills;
- Incentives to promote the development of technological learning and innovation routines within domestic firms, especially in respect of building design and engineering capabilities. Incentives might take various forms, such as credit subsidies, fiscal allowances and matching grants for innovation projects;
- Creation of a set of institutions which increase knowledge linkages among domestic firms, between foreign firms who have invested in LDCs and domestic firms, and between domestic firms and the rest of the world.

In the early stages of catch-up, increasing linkages is likely to involve the creation of specialized, publicly funded agencies to act as intermediar-

Early technological catch-up in the Republic of Korea

During the early stage, domestic firms in labour-intensive, mature industries started developing technological capabilities largely through reverse engineering. Key policy areas were:

- Trade policies to stimulate domestic business start-ups and export promotion to push firms to become internationally competitive;
- Financing purchases through suppliers' credits (at lower rates of interest than those on the domestic market), which increased the attractiveness of capital goods imports;
- Heavy investment in human resource development;
- Encouraging the emergence of large conglomerates (chaebols) which could take advantage of economies of scale and take the lead in developing capacity in successively more complex industries.

Public research institutes were useful, but only in respect of supporting the bargaining power of local firms in the acquisition of foreign technology.

ies between knowledge markets and productive agents. Later, the development of other technological agents, such as engineering firms, machinery producers and business consultancy firms, becomes more important.

Agricultural productivity

Technological advances in small-scale agricultural production and trade are often critical in initiating a catch-up process. In this regard, promoting a "green revolution" in basic staples should be a top priority of STI policy in many LDCs.

From past successful experiences, the first stage in promoting a green revolution should be to establish the basics for agricultural productivity growth, by:

- Improving agricultural knowledge systems, including through greater use of traditional knowledge;
- Focusing on adaptive research (rather than on basic research and development);
- Investing in rural physical infrastructure;
- Establishing adaptive and experimental research stations that are closely integrated with farmers' needs and that promote the exchange of knowledge and experiences between farmers and researchers;
- Investing in extension;
- Where necessary, implementing land reform.

In the next stage, policies should widen the uptake of new technologies. Government interventions are needed to kick-start markets and to enable farmers' access to seasonal finance and seasonal input and output markets at low risk and low cost. In the late stage of catch-up, the State should gradually withdraw: the private sector can take over.

Business firms

Business firms are the basic locus of non-agricultural technological learning and innovation. A major problem facing many LDCs is the lack of such firms.

Many informal micro-enterprises only enable people to subsist. However, there are other, more dynamic petty activities and their transformation into organized small-scale enterprises can be accelerated. Essentially, the key capabilities which are required are core competences (in particular design and engineering capabilities), as well as business management capabilities. In this regard, technical and vocational education and training can play a key role.

Whilst informal micro-enterprises provide an important safety net against destitution for many households, most investment and innovation is carried out by larger, formal firms. Moreover, larger firms are often more innovative than small firms. Efforts should be made to ensure that small firms can grow, by providing incentives and fostering linkages be-

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tween small and medium-sized enterprises and large firms.

Linkages and clusters

Inter-sectoral linkages provide opportunities to develop new activities. In LDCs, two especially appropriate areas are agricultural growth linkages and natural resource-based production clusters.

Agricultural growth linkages

The development of local food processing industries through forward linkages from agriculture is a key mechanism for the development of manufacturing experience and skills. Increasing demand for local consumer goods as a result of rising incomes associated with agricultural productivity growth provides a stimulus for micro-enterprises to transform into small firms.

Natural resource-based production clusters

The main policy objective here is to identify and develop – together with the private sector – the potential for adding value to natural resource production activities, and explore the possibilities for import substitution with local production of some inputs and equipment and for the local provision of some services. One key measure would be to identify the key technologies for developing the production cluster and to put into place mechanisms that support capacity-building to enable those technologies to be deployed and adapted.

LDC Governments need to support early-stage development of linkages and clusters, and, in particular, should identify the short-, medium- and long-term needs in respect of physical infrastructure, science and technology infrastructure and human resources.

More learning from foreign direct investment and trade

International market linkages such as trade and foreign direct investment (FDI) are not presently functioning well as channels of technological acquisition for domestic firms in LDCs (see *LDCR Highlights No. 3*, “Policy action is needed to leverage more learning from foreign direct investment”). Leveraging more learning from international trade and FDI requires active policies. They should aim at not only increasing local inputs in the activities of transnational corporations, but also:

- Stimulating the creation of backward and forward linkages between foreign investors and domestic firms;
- Fostering the development of local firms to enable them to integrate into global value chains, by, for example, supporting the development of national standards and providing technical assistance to firms and farms to raise awareness of technical standards;
- Using investment projects in natural resource-based activities (such as mining) as growth poles by diversifying economic activity vertically and horizontally around a given project.

Finally, LDC Governments could consider whether greater learning benefits might accrue from South–South investment links than from linking up with transnational corporations originating in developed countries. One reason for such an approach is that there is a relatively smaller technology gap between LDCs and other developing countries.

Upgrade exports

An important feature of most LDCs is the non-dynamic nature of their exports. Technological support for ex-

port development requires targeted policies. Whether new export initiatives are started by government action or by entrepreneurial initiatives, their consequent development should be supported by public action to promote both the diffusion and upgrading of technology. These activities may be directed to support traditional agricultural exports, such as cotton or coffee; new niche agricultural products, such as pineapples or cut flowers; labour-intensive industries, such as garments or leather products; or the tourism industry.

There is intense global competition in all these activities, so upgrading is particularly important to ensure the sustainability of these activities.

Capacity to develop STI policies

LDC governments currently have weak capacities to formulate and implement STI policies within development strategies. But this does not mean that such capacities cannot be developed. Governments should adopt an incremental learning approach to policy formulation and implementation, and also ensure that a network of intermediary Government and business institutions is built up to promote good governance in the area of technological learning and innovation. Special attention should be paid to the administrative organization of STI policy as it is a cross-cutting issue which cannot be left to a ministry of science and technology alone.

Finally, STI policy development in LDCs is essentially experimental, and needs “policy space”, to give Governments sufficient room for trial and error, experimentation and manoeuvre and to enable them to formulate policies that are in line with domestic development objectives, irrespective of external conditionalities and constraints.

This issue of *LDCR Highlights* is based on UNCTAD, *The Least Developed Countries Report 2007: Knowledge, Technological Learning and Innovation for Development*, chapter 2. The Report is available on the UNCTAD website (www.unctad.org).