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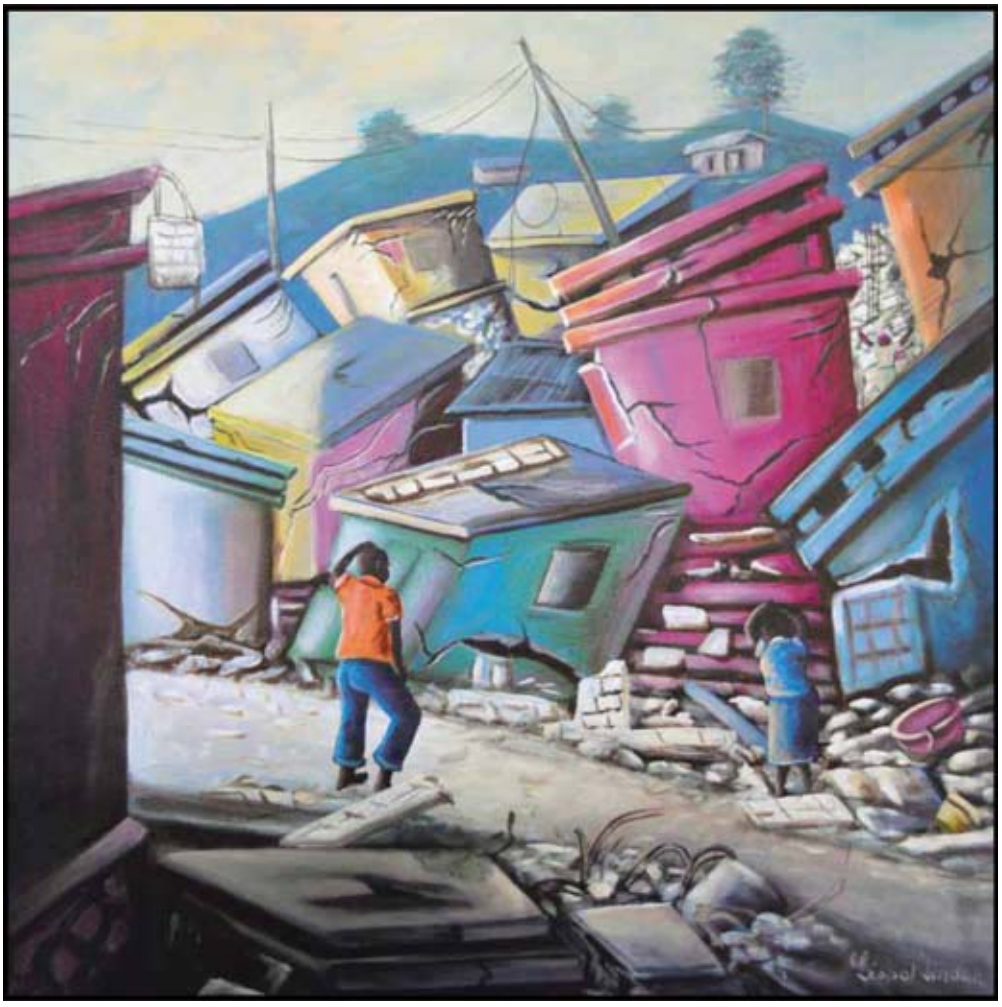
Towards a New International Development Architecture for LDCs

CHAPTER 6

AN AGENDA FOR ACTION:
(III) COMMODITIES AND (IV) TECHNOLOGY



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An Agenda for Action: (III) Commodities and (IV) Technology

Chapter 6

This chapter treats two of the five core pillars of the NIDA, namely, commodities and technology. Without an effective technology policy, the commodity value chain cannot be developed, diversification out of commodities is unlikely to happen, and LDCs which have diversified out of commodities will not be able to upgrade from low-skill manufactures or simple services. Both the commodities and technology issues have been largely neglected in the international economic architecture and represent salient opportunities for constructive initiatives, with major benefits for LDCs.

A. Commodities

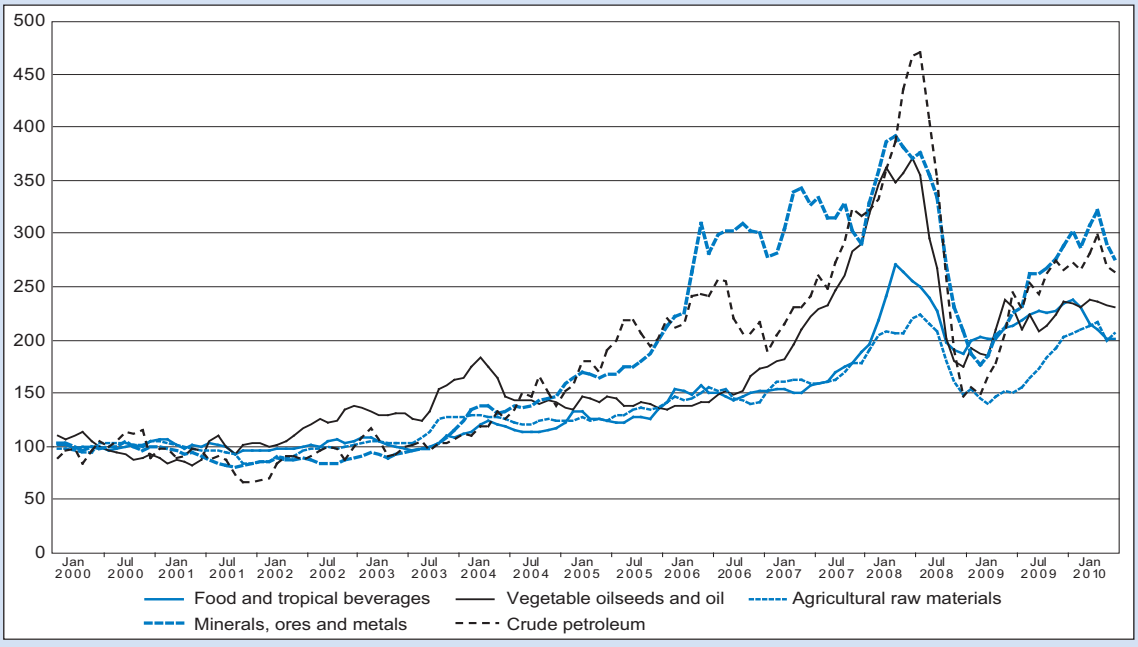
The behaviour of commodity prices is a major development problem for commodity-dependent countries, and in particular the LDCs.

The behaviour of commodity prices is a major development problem for commodity-dependent countries, and in particular the LDCs. The problem arises from a combination of long-term declining terms of trade (for a number of primary commodities) and extremely volatile prices over the short term, which undermines the prospects for productive investment and has negative effects on the productivity of capital. As reported in Borensztein et al. (2009), commodity prices shocks are very persistent, with the year-on-year volatility of prices varying from 10 to 40 per cent across primary commodities. This is likely to exert a negative impact on an economy's balance of payments and external indebtedness. Moreover, price volatility not only hampers fiscal planning, it can also exacerbate social inequalities and impede development (chart 36).

Chart 36

Price volatility for selected commodity groups, 2000–2010

(Indices, 2000=100)



Source: UNCTAD secretariat calculations, based on UNCTAD's *GlobStat* database.

The persistent reluctance of the international community to recognize commodity-related development issues has been extremely costly in terms of foregone development opportunities for commodity-dependent developing countries, particularly LDCs. The workings of international commodity markets are clearly unsatisfactory at present: they are leading to recurrent crises with high social and economic costs for the LDCs. The issue of food security is directly linked to this complex problematic and it therefore requires an urgent response from the international community.

The persistent reluctance of the international community to recognize commodity-related development issues has been extremely costly in terms of foregone development opportunities for commodity-dependent developing countries, particularly LDCs.

The recent food price crisis has revealed a serious case of market failure in the international commodity markets. There is general consensus that global grain markets, in particular, are not functioning well, largely owing to unregulated speculation (i.e. through financial derivatives) by financial investors in agricultural commodity markets. This has generated uncontrollable volatility, leading to increasing concerns regarding the impact of such excessive speculation; if it is allowed to continue, it could well lead to another speculative bubble and another food crisis. This type of market failure in international grain markets needs to be corrected through global collective action. In order to curtail market volatility and ensure a reliable supply of food, numerous stabilization schemes have been considered for some time. Trade-related factors also play an important role in food security, but the link between export volumes and export prices is tenuous, as illustrated by Thailand's experience in 2008 when the large surges in rice exports preceded the price surges. It is therefore clear that there is a need to improve the effectiveness of the international grain markets before trade can become a vehicle for growth in LDCs. This should be a major theme of a future international policy agenda, and as such, an important objective of the NIDA. In the area of commodities, the long-term goal should be structural transformation leading to more diversified economies. But in the short and medium term, some new forms of international commodity policy are required.

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Priority actions in the global economic regime could include the introduction of new measures for reducing the volatility of commodity markets and the adverse impacts of that volatility. Such actions may include the following:

(i) Establishment of a global counter-cyclical financing facility that ensures fast disbursement of aid with low policy conditionality and high concessionary elements upon commodity price shocks;

(ii) Setting up of innovative commodity price stabilization schemes, consisting of both physical and a virtual reserve facilities;

(iii) Introduction of taxation measures to reduce speculation in global commodity markets;

(iv) The counter cyclical loan facility.

A focus for the new generation of ISMs in the area of commodities should be on financial and technical assistance to enable greater local value-added and linkages from resource-based diversification. The problem of highly volatile export earnings can be dealt with through revenue stabilization measures at the national level as well as global measures to reduce commodity price volatility. The ISMs should thus include support to manage and use resource rents better and avoid Dutch disease effects. Financial and technical assistance can also improve country knowledge of the LDCs' natural resource potential and enhance LDC negotiation capacity with TNCs to ensure that a greater proportion of the rents from natural resource exploitation accrue to the LDCs and that those rents support resource-based industrialization.

Resource rents are economic rents derived from utilization of natural resources. The concept is derived from David Ricardo's "economic rents" that can be interpreted as the excess of economic return on a product above the total cost of the product.

1. International support mechanisms for commodity price stabilization

(a) A global counter-cyclical financing facility

Many LDCs find it difficult to conduct successful countercyclical macroeconomic policy at the national level on their own.

The case for a global counter-cyclical financing facility is predicated on the need for countercyclical macroeconomic demand management to facilitate sustainable socio-economic development for commodity-dependent LDCs. Many LDCs find it difficult to conduct successful countercyclical macroeconomic policy at the national level on their own. This is not just because their Governments often lack the capacity to pursue a policy mix that requires highly specialized technical knowledge, but the opportunity cost of holding savings abroad is perceived to be too high in the light of their immediate needs to accelerate economic development and reduce debilitating poverty. Given this, a global countercyclical financial facility for low-income commodity-dependent countries is proposed here, which would ensure the fast disbursement of aid with low policy conditionality and high concessionary elements at times of commodity price shocks.

Demand management of LDC economies is very complex, since an externally induced balance-of-payments crisis can lead to a sharp drop in domestic demand. Orthodox stabilization policies adopted primarily to restore external equilibrium in such circumstances can move the economy further away from internal equilibrium, at least in the short run. In the light of low domestic aggregate demand, these policies can well be procyclical, in the direction of both internal and external market forces, rather than countercyclical as they should be (Nissanke, 2003). For commodity-dependent economies, macroeconomic management is judged as countercyclical when an appropriate policy configuration of fiscal, monetary, exchange rate and financial policies would allow softening the impacts of commodity price shocks on both the external and the internal balances simultaneously.

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Many high- and middle-income countries such as Norway and Chile are known to have successfully abated "Dutch disease" by moderating the transmission of commodity price shocks to the rest of the economy through the establishment of stabilization funds. For example, Chile formally adopted a structural fiscal balance policy in 2001 with a view to developing a cyclically-neutral fiscal policy. This policy enables current expenditure to be stabilized by linking it to the structural level of fiscal revenues.[1, 2] According to this rule-based mechanism, every year the Ministry of Finance calculates a potential structural budget based on the output gap between trend GDP and actual GDP and on the medium-term forecast for copper prices. Expenditure is then calculated with respect to this structural budget so as to allow an annual surplus of 1 per cent. As a result, since 2001, the country has accumulated large surpluses. The surplus is then channelled to the Economic and Social Fund (the former Copper Buffer Fund) and to the Pension Reserve Fund, which are placed in a sovereign fund offshore. The central bank can then recapitalize the assets every five years). This measure allows the provision of financing during revenues for future downturns in the copper price. Thus

Chile deliberately opted for saving the windfall earnings from high copper prices accruing to the public sector and delaying spending for the future when there may be a need to overcome short-term constraints on the absorptive capacity that would have repercussions on the extent of currency appreciation associated with periods of boom.[3]

A countercyclical fiscal policy can be implemented quite easily where revenues from natural resources accrue to the Government, such as in Norway, where the State owns the oil and gas resources.

A countercyclical fiscal policy thus entails the accumulation of revenues from the resources sector during booms, and the use of those revenues in situations of falling prices. This policy not only stabilizes revenues over the commodity price cycle, but also reduces the pressure on the exchange rate to appreciate during the boom period. This kind of stabilization policy can be implemented quite easily where revenues from natural resources accrue to the Government, such as in Norway, where the State owns the oil and gas resources. In Chile, the Government retained a 40 per cent share of the assets of its previously State-owned copper mining company, Codelco, and following its privatization, was able to negotiate reasonable returns from the private companies in royalty payments and a fair tax rate on the remaining share. Further, a new tax regime for the mines was approved and enacted in 2005. This has largely contributed to the accumulation of fiscal surpluses, both in absolute terms and as a percentage of GDP, since the beginning of the recent copper boom in 2002–2003.

Many low-income developing countries and in particular LDCs, settled for very unfavourable terms and deals during the process of privatization of their national resources...

Unfortunately, many low-income developing countries and in particular LDCs, by contrast settled for very unfavourable terms and deals during the process of privatization of their national resources negotiated under the auspices of the International Monetary Fund (IMF) and World Bank. For example, Bova (2010) reports that Zambia's copper industry, which was earlier dominated by the State-owned enterprise, Zambia Consolidated Copper Mines (ZCCM), underwent a sweeping privatization process in the 1990s. The company was split into a number of mining companies owned by transnational corporations (TNCs), with the Government retaining a small share. Despite the attempt to secure a better deal through the Mines and Minerals Act of 1995, these TNCs benefited from very low royalties, export taxes and taxes on profits, negotiated under development agreements signed subsequently between the Government and the TNCs involved.[4] As a result, the contribution of the mining sector to the fiscal budget has been very marginal. Further, the foreign exchange earned from copper exports has gone directly to the currency market under the float-cum-monetary target regime that has been in operation, rather than to the central bank. This has not only resulted in a procyclical movement of exchange rates (a large currency appreciation during the boom and a sharp depreciation during the bust), but it has also prevented the Zambian Government from establishing stabilization funds from export revenues. Thus, under its prevailing monetary and fiscal regimes, Zambia is left with little room to pursue a countercyclical policy intervention.

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These negative impacts could be offset by appropriate countercyclical financial facilities for low-income countries at the global level. However, the Compensating Financing Facility with low policy conditionality established at the IMF in 1963 did not offer funding on a concessional basis. The subsequent IMF facilities that replaced it have been highly conditional upon accepting a policy package requiring pro-cyclical, contractionary demand management, which proved very costly to many LDCs in terms of forgone socio-economic development. The contractionary bias in the IMF facilities was so strong that it prevented the LDC Governments concerned from undertaking social programmes or public investment on a sustainable basis during the 1980s and 1990s when most commodity prices were declining and displayed high volatility.

Historically, apart from the international commodity agreements (ICAs), there have been a number of compensatory facilities to offset shortfalls of commodity export earnings, such as the IMF's Compensatory and Contingency Financing Facility (CCFF) and the European Commission's STABEX – the compensatory finance scheme to stabilize African, Caribbean and Pacific (ACP) countries' export earnings (Maizels, 1994; Hewitt, 1993 and 2010). While the original IMF Compensatory Financing Facility (CFF) was established in 1963 as a low-conditionality, semi-automatic mechanism for temporary balance-of-payments support (on a non-concessional basis), the CCFF — the new, non-concessional facility established in 1988 to replace the CCF — has become so highly conditional upon accepting procyclical demand management, that since its inception very few countries have turned to it for assistance. The CCFF and CFF mechanisms of the IMF were replaced by the Exogenous Shock Facility (ESF) in 2006. This is a concessional loan facility for countries facing an exogenous shock that qualify for Poverty Reduction and Growth Programmes. The ESF was not used until it was reformed in 2008 and when the LDCs began to feel the full impact of the global economic crisis in 2009.[5]

Similarly, the STABEX scheme has met with rather limited success owing to the procyclical nature of its disbursements. Moreover, since compensation under the STABEX was delivered in the form of grants only to agricultural sectors affected by income shocks, it has been argued that it resulted in a diversion from other forms of official development assistance (ODA), and that the STABEX has tended to discourage diversification efforts.[6] FLEX, which replaced STABEX and SYSMIN under the Cotonou Agreement of 2000, has been under criticism for its slow disbursements and resource constraints, though the recently introduced V-FLEX mechanism is a significant improvement (see chapter 5). In addition, loans extended by the Poverty Reduction and Growth Facility (PRGF) of the IMF are intended to assist countries to cope with economic shocks beyond their Governments' control which have a negative impact on their economies. However, the conditionalities associated with those loans have often been too restrictive.

With the emergence of market fundamentalism and the consequent demise of ICAs (for various political and technical reasons), the use of market mechanisms for managing commodity price risks has been advocated by the donors for dealing with risks stemming from extreme price volatility and the accompanying income shocks. The international financial institutions (IFIs) have been actively encouraging primary commodity producers to use market-based, commodity-linked financial risk-hedging instruments by participating in futures and derivatives markets. So far, these have not proved very successful.

To sum up, an adequate compensatory financing facility which provides fast disbursement of aid with low policy conditionality to help LDCs and other low-income countries deal with commodity price shocks, does not exist. Yet, it is necessary.

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(b) Innovative commodity price stabilization schemes

Unregulated markets and the use of derivative instruments (i.e. financial contracts) by financial investors with little interest in physical commodities have generated excessive volatility. Consequently, stakeholders in physical commodities have been unable to rely on price signals emanating from markets for making informed decisions concerning future demand and supply

developments, including decisions affecting investment and technological progress required for substitution and conservation of resources. In the light of the recent large price swings that contributed to the current global economic crisis, there is a fresh case to be made for price stabilization.

Disappointment with the previous commodity stabilization schemes through buffer stock management and export quota allocation under the ICAs of the 1980s cannot be used as a legitimate and easy excuse for no action. While price variations can provide traders and investors with attractive short-term gains, the long-term consequences from asset price bubble-bust cycles are now widely acknowledged to be devastating, inflicting very heavy collateral damage on trade and real economies as well as very high social costs worldwide. The recent global economic crisis is a clear testimony to the existence of an enormous wedge between private returns and social returns from activities in asset markets. It has created not only winners and losers in a grossly unfair proportion, but also a negative-sum game for the global economy and community.

The significant failures in commodity markets also warrant effective intervention through new stabilization mechanisms alongside various international regulatory measures.

The significant failures in commodity markets warrant effective intervention through new stabilization mechanisms alongside various international regulatory measures. As commodity market operations have become very sophisticated, using complex derivative products and instruments, any policy intervention has to be innovative. Relying exclusively on buffer stock management for stabilization can be both ineffective and costly in the context of rapidly changing market fundamentals, such as those observed during the period 2002–2008. Similarly, earlier experiences demonstrate that stabilization schemes through export quota allocations or other supply management mechanisms among producing countries entail significant transaction costs for the negotiating parties, as well as other technical problems, such as coordination failures and free-rider problems. Undeniably, good inventory management of all commodities and goods is a necessary condition for avoiding extreme price volatility in the short run. Strategic reserve holdings should always be kept at a prudent level for many essential commodities. It is now well recognized that the inadequately low levels of stocks of some grains contributed to the food crisis of 2008.

New stabilization schemes should contain an element of "virtual" intervention that can be activated fast with a view to taming markets quickly when speculative bubbles are about to develop.

In addition to improving strategic inventory management, it has become important to establish an effective instrument for efficient intervention with "innovative" stabilization mechanisms. Such an intervention should be "market friendly" so that intervention is switched on and off as market conditions vary. Intervention should not impede market development and deepening, as increased liquidity is critical for effective risk hedging. However, as soon as markets build up towards bubble conditions, an intervention should be triggered to signal traders that their destabilizing speculation will be counteracted. However, when market fundamentals evolve fast, it may be hard to maintain commodity prices within a particular reference zone pre-negotiated with conventional stabilization instruments. When it becomes difficult to defend price levels due to rapidly changing parameters that affect fundamentals, a more effective strategy may be one that aims at intervening to dispel rapid and excessive volatility in markets by inducing a swift change in trading behaviour away from destabilizing speculative trading. Thus, new stabilization schemes should contain an element of "virtual" intervention that can be activated fast with a view to taming markets quickly when speculative bubbles are about to develop.

From a development perspective, there is need for a global facility with the following innovative modalities and mechanisms: (a) a set of innovative commodity price stabilization mechanisms distinctly different from the earlier schemes operated under the ICAs of the 1980s; and (b) a global commodity supply management facility to enable countercyclical demand management in commodity-dependent low-income economies.

A new global international arrangement consisting of a two-pronged approach to stabilizing food prices through food reserves has been proposed by von Braun and Torero (2009) (called the IFPRI proposal). The intervention mechanism proposed involves the establishment two types of reserve mechanisms: an actual physical system and a virtual reserve system, which will minimize any speculative attacks on food commodity markets in order to avoid price spikes in the future. This approach is a combination of market and State efforts to stabilize commodity prices, which could create the conditions to modernize agriculture in LDCs, through improving the investment climate. While this physical, public, globally managed grain reserve system would remain small, a virtual reserve mechanism would need to be backed by a fund, to be financed by the main grain-producing countries. The virtual reserve facility, backed by funded promissory notes, could be used for timely intervention in futures markets to prevent price spikes and keep prices close to long-run fundamentals. This scheme thus attempts to realign prices with market fundamentals and reduce any "excess" volatility created by "noise traders" through the use of "virtual" reserves.

A new global international arrangement consisting of a two-pronged approach to stabilizing food prices through food reserves has been proposed.

Under the first prong — physical food reserves — the strategic reserves of each country would be maintained at about a 5 per cent level of the current food aid flow, and perhaps managed by the World Food Programme (WFP) in different locations in developing regions. Their management could be potentially financed by emerging funds provided by the G-8+5 countries (i.e. G-8 plus Brazil, China, India, Mexico and South Africa). The second prong would be operated by member countries participating in the proposed scheme (the Club), and would be backed by a virtual reserve with promissory notes. It is also envisaged to establish two institutions: an intelligence unit and a high level technical commission, to closely monitor price movements, and design and maintain a dynamic price band system based on market fundamentals. These entities, it is envisaged, would help prevent noise traders from engaging aggressively in destabilizing speculation, while monitoring legitimate investments.

The public goods function of price stabilization could be realized by the application of a multi-tier transaction tax system applied to commodity derivatives markets.

(c) A multi-tier transaction tax system for commodity derivatives markets

The public goods function of price stabilization could also be realized by the application of a multi-tier transaction tax system applied to commodity derivatives markets. A *currency transaction tax* could be imposed with the aim of making "exchange rates reflect to larger degree long-run fundamentals relative to short-range expectations and risks" by strengthening the weight of regressive expectations relative to extrapolative expectations. It is envisaged that the multi-tier transaction tax structure would be embedded in a moving target zone system. The scheme would be applied to each commodity, achieving similar results to those sought through the dynamic price band system in von Braun and Torrero (2009).

As discussed in the literature on the target zone exchange-rate regime, a band can perform the function of *crystallizing market expectations* of where the fundamental equilibrium may thus make expectations stabilize at the

time horizons relevant for influencing market behaviour (Krugman, 1991; Svensson, 1992). A successful band regime can also be very effective in limiting price variability by preventing noise traders, particularly stop-loss traders, from making money by introducing noise into markets (Rose, 1996). A band can exert a stabilizing effect on prices only when it can ensure that expectations are formed in a stabilizing manner. The transaction tax proposed would be one of a number of policy instruments used to introduce and sustain the required credibility for stabilization purpose.

Under the two-tier tax system, for example, the first-tier tax rate would be set at zero or a near zero rate under a tranquil, normal market condition when prices are within a band, so that markets can function efficiently with plenty of liquidity. However, once prices start deviating significantly from the target price band, a higher, second-tier tax would be levied on a portion of derivatives transactions and deals as a "surcharge" to curb the "excess" in price volatility. Importantly, this system would need to be executed under a two-tier structure at minimum, since the credibility of the surcharge levy would be anchored in the fact that the transaction tax system is already in place. The price surcharge could be administered both timely and swiftly only in conjunction with the underlying transaction tax, which would serve as "a monitoring and controlling device for the price surcharge". Thus the surcharge would function as "an automatic circuit-breaker at times of speculative attacks" as envisaged by Spahn (1996: 24) with regard to its application in currency markets. In a less volatile condition, neither liquidity nor market efficiency would be impaired or compromised, as a zero or a near-zero rate would be applied. At the speculative end, however, the high price surcharge would be applied temporarily to tame markets. Under a multi-tier system, tax rates could be varied in a more refined manner as market conditions change.

The main aim of the scheme would not be to set and defend a particular narrow, pre-negotiated price band, as in the earlier stabilization mechanisms, but to prevent excessive price volatility not warranted by market fundamentals, such as those observed in 2008—2009.

Once such system is seen to be operating efficiently and with credibility, the threat of a surcharge levy alone may well be sufficient to keep prices within a target zone, without having to resort to costly, sizeable holdings of reserves or buffer stocks. The system would thus allow breathing space for an orderly realignment of commodity prices with shifting fundamentals. In this context, it should be noted that the band in the proposed multi-tier tax scheme would be a moving one that reflects continuous changes in fundamentals. Further, the width of the band should be adjusted according to the way changes in fundamentals evolve, though it would always be better to set the band wide enough to allow a margin of error in forecasting, possibly due to a high degree of uncertainty, and also so as not to undermine liquidity. The main aim of the scheme would not be to set and defend a particular narrow, pre-negotiated price band, as in the earlier stabilization mechanisms, but to prevent excessive price volatility not warranted by market fundamentals, such as those observed in 2008—2009.

The scheme would be deemed successful, when it manages to drive destabilizing speculation out of markets and the surcharge is never levied. With this form of credible intervention, using the threat of imposing a high tax rate when traders cross some critical thresholds, markets should become neither dominated by uninformed, noise traders nor contaminated by noises. In this sense, the scheme would operate as a virtual intervention with a view to achieving commodity price stabilization through the "announcement" or "honeymoon" effect (Krugman, 1991; Krugman and Miller, 1993). With regard to the development of price dynamics, the scheme aims to work effectively in influencing the formation of traders' expectation.

(d) A countercyclical loan facility: Indexing the contingency facility to debtors' capacity to pay

As noted by some observers (Nissanke, 2010), the protracted debt crisis in the heavily indebted poor countries (HIPCs) was associated with the failure on the part of the donor community to institute an effective and flexible facility for contingency financing on an ex-ante basis to deal with external shocks faced by HIPCs. Instead, throughout the 1980s and 1990s, official creditors applied ex-post debt relief mechanisms, with attached policy conditionalities, in response to recurrent liquidity crises and the ensuing debt overhang. Hence it is critically important to establish genuinely flexible, state-contingent debt relief mechanisms in order to avoid the recurrence of debt crises and debt overhang, which have stalled the economic development of low-income countries for so long. This is because the state-contingent schemes could make a distinction between the consequences of debtors' own efforts and events beyond their control. Such a scheme could specify their contractual obligations contingent on the nature of conditions prevailing in the country and hence deal explicitly and effectively with uncertainty associated with exogenous shocks and systemic risks that are present in any intertemporal financial transactions. For example, as Krugman (1988) notes, the trade-off between debt forgiveness and financing in a typical negotiation can be improved by indexing repayment to the "state of nature", which is verifiable.

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Another potentially very important innovation in the global regime is a countercyclical loan facility indexed to the debtors' capacity to pay. Cohen et al. (2008) contended that subsidized contingent loans are superior to outright grants in financing productive investment in countries facing high vulnerability to external shocks, such as natural resource price volatility. They suggest that debt and debt cancellations are two complementary instruments, which, if properly managed, perform better than either loans or grants taken in isolation. Taking these arguments further, they propose a new contingency facility: the countercyclical loan (CCL). The CCL facility would transform the grace period of a typical concessional loan into a fixed initial grace period and a floating grace period. More concretely, they propose to reduce the grace period of a typical concessional loan from ten to five years, and to keep the remaining grace period as an asset that the country could draw upon when a negative shock takes place. The negative shock is defined as an export shock, whereby current exports fall below a moving average of the previous five years.

The CCL facility would transform the grace period of a typical concessional loan into a fixed initial grace period and a floating grace period.

By indexing the contingency facility to the debtors' capacity to pay, the CCL may not completely avoid the potential "incentive" problem. However, it amply demonstrates that any technical issues associated with creating an "efficient" contingency facility can be overcome if there is a strong political commitment to such a facility.

2. Domestic resource generation and revenue management

(a) Managing rents and stabilizing revenue

Natural resource rents are potentially the most important source of revenue in a number of LDCs since a large share of FDI in LDCs targets the extractive industries. In the mining sector, most LDC Governments lease property rights to foreign TNCs for exploiting a mining area in exchange for economic rents. This often raises issues relating to patrimonial States, corruption,

governance, weak States, conflict and lack of capital controls. The issue of fair distribution of national resource rents (i.e. increased fiscal receipts for LDC Governments from mining activities), especially to host Governments, has not been resolved. Overall, most LDCs have expressed dissatisfaction in this area. The practice of mineral taxation needs to be elaborated, allowing the host-country Governments to gain much-needed revenues for use in achieving their economic and social development goals. For LDCs to benefit from their natural resources, such as minerals, oil, gas, copper, gold, phosphates, tin and cobalt, the vital issue of resource revenue-sharing with TNCs needs to be resolved.

Natural resource rents are potentially the most important source of revenue in a number of LDCs since FDI in LDCs targets the extractive industries.

Resource rents that exhibit major short-term price instability are based on changes in the international economy and the consequent supply and demand for commodities, over which LDCs have no control. International commodity prices are characterized by long-term stability but high short-term volatility, which leads to instability in LDC Governments' fiscal regimes (i.e. in terms of the level and distribution of resource rents). This instability makes it difficult for Governments to devise and implement their development plans. Thus stabilizing resource rents is considered an essential condition for revenue stabilization. Revenue stabilization may be understood as any policy that promotes a predictable level of minerals-derived government revenues. This includes both the revenues obtained from the State-owned enterprises as well as taxes collected from private industry.

An important policy issue in terms of rent management is the avoidance of Dutch disease. Many LDCs have ample, underutilized productive capacities that can be readily mobilized to respond to increased demand (UNCTAD, 2006 and 2007). Most LDCs operate far below the "production possibility frontier" — they are not fully utilizing all the available productive resources for the Dutch disease to take root. The role of public sector spending should be to crowd in private investment rather than crowd it out. It is unrealistic to assume full employment conditions in LDCs. When this condition is relaxed, the immediate likelihood of the Dutch disease diminishes considerably.

The vital issue of resource revenue-sharing with TNCs needs to be resolved.

However, many LDCs suffer from serious supply bottlenecks, particularly weak infrastructure and skills. Governments can make greater use of fiscal policy to overcome the main constraints on growth through public investment to stimulate private investment and channel resources towards the expansion of aggregate supply in strategic economic sectors. This should mitigate possible Dutch disease effects. But in order for fiscal policy to be effective, it must be supported by monetary and exchange-rate policies.

Therefore — the so-called Dutch disease is not an inexorable curse; its prevention is highly dependent on policies, institutions, learning conditions, and other complementary monetary and fiscal policies which would neutralize the negative impacts of foreign capital inflows, including ODA. This requires the channelling of resources to strengthen national capacities to mobilize public revenue and domestic savings, and improve the fiscal regime and tax collection. All of this should help Governments to manage short-term, adverse macroeconomic effects, thereby mitigating the Dutch disease. However, it is also undeniable that some effects of the Dutch disease (slow growth, deindustrialization, low productivity and low export earnings) have been observed in some LDCs, such as Zambia (Weeks, 2008). Mineral-rich LDCs have undoubtedly experienced lower levels of industrialization and structural change than many other developing countries that lack any static comparative advantage in natural resources. Further research is required into this issue, as

An important policy issue in terms of rent management is the avoidance of Dutch disease.

the evidence remains ambiguous regarding the long-term impact of foreign inflows into resource-rich LDCs, and how best to manage them during boom years as well as price collapses.

(b) A resource-based development strategy

Based on the experiences of successful resource-based industrialization, it can be assumed that the key elements of a strategy based on natural resources to catalyze industrialization, particularly the "deepening" of the resources sector, can best be achieved by optimizing linkages with the local economy. The following are some of the principal resource-related opportunities:

- *Resource rents:* The use of resource differential and windfall rents to improve the basic physical and knowledge infrastructure of a country through investment in physical infrastructure (e.g. transport, telecoms and energy) and social infrastructure (e.g. human resource development, R&D and technology);
- *Infrastructure:* The collateral use of high-rent resource-related infrastructure to open up other resources' potential (such as agriculture, forestry and tourism)[7] by providing access to zones of economic potential with lower returns (e.g. agriculture), which cannot afford their own dedicated infrastructure;
- *Downstream value addition:* Use of the locational advantage of producing crude resources to establish resource-processing industries (e.g. beneficiation), which in turn could provide the inputs for manufacturing;
- *Upstream value addition:* Use of the resources sector market to develop the resource supply/inputs sector (capital goods, consumables, services). This often offers a relatively large market for specific inputs for particular resource exploitation.
- *Technology/product development:* Resource exploitation technologies generally need adaptation to local conditions (e.g. climate, mineralogy, terrain), which provides opportunities for the development of niche technological competencies in the resources inputs sector. This sector tends to be knowledge-intensive and accordingly needs "priming" through public investment in human resource development and R&D.

The new generation of ISMs in the area of commodities should focus on various kinds of financial and technical assistance to enable greater local value added and linkages from resource-based diversification.

The key elements of a strategy based on natural resources to catalyze industrialization, particularly the "deepening" of the resources sector, can best be achieved by optimizing linkages with the local economy.

The new generation of ISMs in the area of commodities should focus on various kinds of financial and technical assistance to enable greater local value added and linkages from resource-based diversification. There are three crucial ISMs needed for optimizing resource endowments, as discussed below.

ISM 1: Improving the knowledge infrastructure for raising the level/ quality of data on a country's natural resource potential.

The less that is known about the potential value of a resource, the greater will be the share of the rents that the investor will understandably demand, due to the high risk and cost of discovering or dimensioning the resource, which may not be viable. This applies mainly to mineral and energy resources, but also influences the deals struck for other resources such as agricultural terrains, forestry, fisheries and tourism attractions. Most LDCs lack basic geological mapping or, at best, they are poorly mapped. This increases the risk for investors, who consequently demand extremely favourable tax regimes for any operation that may result from their exploration. It stands to reason that the more a country knows about the potential value of a resource,

the greater will be its ability to strike an equitable deal on the division of future rents and benefits accruing from the exploitation of the resource. It is therefore important for an LDC to tackle this "knowledge infrastructure" challenge. Numerous studies suggest very high potential returns to the State from investment in basic geological surveys (Jourdan, 2008). Thus, in addition to investing in physical infrastructure development in LDCs, bilateral and multilateral donors could consider investing in improving LDCs' resource knowledge infrastructure.

Improving the knowledge infrastructure for raising the level/quality of data on a country's natural resource potential, improving LDC capacities for negotiating contracts and resource pooling are critical.

ISM 2: Improving LDC capacities for negotiating contracts

Generally, the negotiation of contracts between LDCs and resource-exploiting TNCs is extremely asymmetrical: TNCs usually have considerably greater resources and skills than the host-country Governments. Recognizing this shortcoming, the African Development Bank is establishing a legal advisory capacity to support its member States in handling complex, long-term contract negotiations. The LDCs need to optimize the leasing (licensing) of their natural resource assets at the outset (i.e. through the exploitation contract). This is because it is difficult to renegotiate contracts at a later stage without sending negative signals to investors regarding the certainty of contracts, as it would lead to negative perceptions among investors, concerning the investment risk.

ISM 3: Resource pooling

The third critical intervention area is in creating or improving LDCs' capacities for ongoing auditing, monitoring, regulating and improving resource exploitation regimes and for developing linkages between the resource sector and the rest of the domestic economy. This could be facilitated by including a skills transfer clause in all contracted consultancies during the lease/licensing negotiations, as well as using a targeted strategy for the ongoing development of skills. Given the dearth of people with these skills in LDCs, consideration could be given to the pooling of resources with neighbouring countries through joint regulation of cross-border resource-related infrastructure (e.g. transport authorities, power pools, water catchment bodies), possible joint management of cross-border resources and the creation of a regional capacity within regional economic communities. This capacity could also be enhanced by acceding to regional and international resource monitoring and oversight bodies such as the African Union's African Peer Review Mechanism (APRM), the Extractive Industries Transparency Initiative (EITI) and the Kimberley Process for diamonds certification.

There is no one-size-fits-all strategy for strengthening LDC resource governance and institutions, but there are a few broadly applicable strategies, such as accession to international protocols (e.g. APRM, EITI) and the establishment of critical institutions.

Ultimately, there is no one-size-fits-all strategy for strengthening LDC resource governance and institutions, but there are a few broadly applicable strategies, such as accession to international protocols (e.g. APRM, EITI) and the establishment of critical institutions, to facilitate the optimal exploitation of natural resources.

With the aim of addressing the discussed challenges of the commodity-dependent economies, including the impact on long-term energy and food security, UNCTAD has established an agenda of research, analysis, capacity building, policy implementation and outreach, especially in the area of oil and gas. This agenda seeks to extract greater development gains from natural resources in commodity-dependent economies. The objective of these activities is to bring together key stakeholders through venues such as the Africa Oil, Gas, Minerals Trade and Finance Conferences (since 1997), the Sustainable Commodity Initiative (since 2002) and the Global Commodities

Forum (since 2009). The UNCTAD Initiative on Oil and Gas illustrates how technical support and information exchange can improve the development gains from commodities.

B. Technology

1. Introduction

Following the discussion in chapter 3 of this Report, there are two critical weaknesses in the current knowledge architecture. First, there has been an almost exclusive focus on the promotion of technological change and knowledge accumulation activities through the granting of exclusive intellectual property rights (IPRs). This trend, largely evolved in line with the development of the knowledge-based economy in the industrialized world, and does not reflect the ground realities in which LDC economies operate. The second weakness relates to the difficulties of considering technology transfer and technology-sharing issues within a regime that is primarily geared to IPR protection. While the multilateral intellectual property architecture has been etched out in the WTO TRIPS Agreement, as yet there is no global framework governing issues of technology which would treat intellectual property, technology transfer and the growing knowledge divide between countries in a balanced way. Currently, technology and its transfer is largely an annexure to provisions governing IPRs within the TRIPS Agreement. It focuses unevenly on IPR protection rather than on creating more global public goods that could ensure access to knowledge and technological know-how by developing countries and LDCs. While some headway has been made, and the Development Agenda for the World Intellectural Property Organization (WIPO) is a step in that direction (box 12), the inherent conflict between the *a priori* goals and principles of the IPR regime and the emerging consensus on the development needs of LDCs has yet to be addressed.

While the multilateral intellectual property architecture has been etched out in the WTO TRIPS Agreement, as yet there is no global framework governing issues of technology which would treat intellectual property, technology transfer and the growing knowledge divide between countries in a balanced way.

In the field of technology, LDCs have not been able to use targeted measures, such as the extension of deadlines for IPR protection for LDCs, to the best extent possible. This is mainly because of a fundamental friction in the universal framework conditions within which they operate. The ongoing struggle for policy space and policy support to create a level playing field in technology issues within the WTO and the WIPO Development Agenda has been accompanied by a parallel trend wherein greater IPR protection has become an important component of economic partnership agreements and free trade agreements (Latif, 2010). The mutually exclusive nature of the two discourses and the shrinking policy space for LDCs as a result, is reflected in the struggle over the scope, applicability and use of Article 66.2 of the TRIPS Agreement and in the unresolved issues relating to technology transfer in the WIPO Development Agenda, both of which are discussed in chapters 3 of this Report.

LDCs urgently require a new, coherent and dynamic pro-development knowledge architecture that is centred on their technological needs.

LDCs urgently require a new, coherent and dynamic pro-development knowledge architecture that is centred on their technological needs. The new knowledge architecture is construed as a system of formal and informal practices, rules, institutions and standards that manage the creation and diffusion of knowledge in ways that are equally applicable and accessible to all countries regardless of their stage of development. Such new knowledge

Box 12. Progress under the WIPO Development Agenda

The WIPO's Development Agenda, adopted in 2007, stems from a critique of WIPO and its technical assistance programmes.[a] It seeks to create a balance between IPR holders and the development interests of LDCs and other developing countries (ODCs). The agenda, which consists of 45 recommendations that form part of six clusters of activities, is regarded as a significant institutional step in global intellectual property relations. The premise of the agenda is that WIPO needs to improve its developmental orientation in all its activities, in order to be able to assist developing countries and LDCs in their quest for greater access to knowledge and greater policy flexibility to design and implement development-relevant IPR rules.

Several recommendations of the Development Agenda deal directly and specifically with issues of importance to LDCs, including technology transfer (Cluster C, recommendation 26). While two projects are currently under way as part of the Development Agenda, a third, on technology transfer, has been postponed by the Committee on Development of Intellectual Property (CDIP) owing to a lack of consensus on what constitutes technology transfer.

In principle, the Development Agenda aims to benefit LDCs and ODCs that have experienced long-standing normative and practical constraints on access to public goods and limited options to pursue development-related IPR rules. However, its effectiveness will depend on the institutional processes that dominate WIPO.

a Developing countries first presented a detailed plan to reform WIPO in April 2005, as a result of which a provisional committee was created for the development agenda in October 2005. The initial proposal by Argentina and Brazil was co-sponsored by 12 additional developing countries. The "friends of development" coalition concluded that WIPO needed to improve its developmental orientation in all its activities, and called for the establishment of a development agenda to reform and guide WIPO's future activities.

architecture is required both to enhance the knowledge intensity of countries' activities and to close the gap between formal and informal production structures in their economies (Ocampo, 2005). A fundamental role of the new knowledge architecture would be to garner greater international support to enable LDCs to tread this path by providing a coherent framework of institutional mechanisms (through ISMs) that promote the emergence of technological capacity in LDC economies.

This Report suggests that the new knowledge architecture needs to be based on four major systemic reorientations of the overall economic regime:

(i) Create a balance between the private and public dimensions of knowledge;

(ii) Support the emergence of a new, coherent reality for technology transfer that complements the building of domestic capabilities;

(iii) Support the mobilization of domestic resources to promote knowledge-intensive activities; and

(iv) Support the emergence of the learning-oriented developmental State.

A fundamental role of the new knowledge architecture would be to garner greater international support to promote the emergence of technological capacity in LDC economies.

(a) Creating a balance between the private and public dimensions of knowledge

Knowledge has been assumed to have properties of a purely public good, in that it is non-rivalorus and non-excludable. Its non-rivalorus nature implies that the possessor of an idea or information is not diminished when others use the idea. A low marginal cost for the reproduction or distribution of knowledge results in its non-excludability, which in effect makes it relatively affordable for others to have access to new information, except when that information is legally constrained by an IPR. This view of knowledge as a public good, inspired by the work of Arrow (1962), was seminal in the sense that it provided the basis for a new framework to look at issues related to the generation of socially relevant information. However, two aspects stand out: Arrow contended that an incentive scheme is required, but he did not specify what sort (Gallini and Schotchmer, 2002); and, although he pointed

out clearly why knowledge sometimes exhibits properties of a public good, he did not categorize knowledge and specify the categories of knowledge in which these features were manifest. In other words, while there are instances where already created information can be disseminated at marginal costs, this certainly does not hold good for technological knowledge and information. Hence, the view of knowledge as a public good which is freely available, for instance in codified information accessible without or at little cost and easily transmitted across space and time, does not reflect the reality of innovation and development in firms and countries.[8]

Technological knowledge is both a public good and a proprietary good (or quasi-private good) as elaborated by scholars of evolutionary economics (e.g. Nelson and Winter, 1982). There are several important activities in technical change for which IPRs do not offer any incentives at all, and in LDCs these activities assume much importance. By focusing unevenly on one particular incentive for knowledge creation that is of limited use in an LDC context (e.g. granting IPRs to ensure returns on R&D investments) the IPR regime is shifting precious resources and institutional capacity away from creating an environment conducive to knowledge acquisition and use (Gehl Sampath and Kozul Wright, 2010). At least the same amount of resources need to be devoted to ensure the effective implementation of Article 66(2) of the TRIPS Agreement.

There are several important activities in technical change for which IPRs do not offer any incentives at all, and in LDCs these activities assume much importance.

(b) Supporting the emergence of a new coherent regime for technology transfer that complements the building of domestic capabilities

Technological learning can result from the transfer of technology that occurs in various ways, including the presence of foreign-owned firms; joint ventures; FDI inflows; technical assistance programmes and other forms of aid; technology licensing contracts; imports from upstream suppliers, especially of capital goods; research collaborations; and subcontracting agreements (Knell, 2007). However, so far the many debates on technology transfer in the WTO and other international forums, have failed to produce a consensus on what comprises successful technology transfer and the ways and means in which to assess it.

This Report calls for a change in perspective to factor in the twin relationship between technology transfer and domestic technological capabilities. The development of local capacity to adapt, apply and develop appropriate technologies that are best suited to local conditions is an essential adjunct to effective policies for technology transfer and adaptation. Extensive evidence on the topic points to the fact that successful transfer of technologies is equally rooted in the presence of sufficient absorptive capacity in the local contexts (in terms of ability to engage in learning by doing, and incrementally innovate) as it is in the appropriate design of technology transfer initiatives. Although industrial policy narratives are replete with examples of countries that managed to build sectors primarily on the basis of continuous investments in technological capabilities without large-scale transfers of technology, in the LDC context progress in achieving greater domestic technological capabilities needs to be supported by greater international support for technology transfer.

The development of local capacity to adapt, apply and develop appropriate technologies that are best suited to local conditions is an essential adjunct to effective policies for technology transfer and adaptation.

For this to materialize, a new reality of technology transfer needs to find shape; that is based on three considerations. First, the relative importance and scope of knowledge and technological change in the catch-up process has changed. Experiences of the newly industrializing economies and the now

industrialized countries indicate a pattern of accumulation of capabilities, wherein learning trajectories of firms and other actors in the innovation system almost always progress from reverse engineering and adaptation to incremental innovation, and then to an R&D-based approach (Kim, 1997; Amsden, 1989; Amsden and Chu, 2003). Budworth (1996) similarly classifies innovation into several degrees, predicting that incremental innovations are most likely to be prevalent in latecomer countries such as LDCs. In this classification, incremental innovations can range from small changes in process technologies that lead to significant improvements in production methods or organizational techniques that help improve delivery efficiency of existing products, or lead to the production of new, technologically improved products. In the early literature, however, incremental innovation is not usually recognized as being part of the R&D process, because it may overlap with development and is not formalized as a clear category of activity (Rosenberg, 1982). Despite this, incremental innovation is a very important stage in capacity-building processes at the firm level and, affirms the ability of enterprises to use and adapt existing knowledge and create commercially viable products. Such product creation, although not new to the world or science at large, constitutes a significant step towards the creation of independent local enterprises in latecomer countries, thus becoming the backbone of industrial activity.

A change in perspective is called for, to factor in the twin relationship between technology transfer and domestic technological capabilities.

While these distinctions are important, technological progress and catch-up in LDCs may not necessarily follow the same trajectory as witnessed earlier due to several new limitations on reverse engineering and imitation of technologies, especially as part of TRIPS-plus clauses contained in regional arrangements and bilateral free trade agreements to which several LDCs are signatories (*LDC Report, 2007*). Technology's ubiquitous role in economic development calls for a more progressive approach for LDCs, which would perceive knowledge accumulation and capacity for innovation more broadly as creating a basis for technical change and progress across a wider range of competencies in a continuum of incremental innovation and greater R&D capabilities simultaneously. This dual focus is critical for bridging the existing and newly emerging gaps in knowledge infrastructure.

Such an alternative conceptual understanding of technology and innovation provides the rationale for a new institutional knowledge infrastructure that will promote knowledge spillovers associated with collective learning and external economies (Marshall, 1921; Young, 1928; Stigler, 1961; Richardson, 1996), as well as the "democratization of knowledge" (von Hipell, 2006). This will require a particular emphasis on institutional cooperation, not only within but also between the various components of national systems of innovation in LDCs, including with external sources of knowledge. Its aim would be to encourage shared or joint technological activities in networks that promote learning.

Technical change and knowledge accumulation is linked to trade, commodities, climate change adaptation and mitigation and other important areas of international cooperation between LDCs and other countries in the global economy.

(c) Supporting the mobilization of domestic resources to promote knowledge-intensive activities

Technical change and knowledge accumulation is linked to trade, commodities, climate change adaptation and mitigation and other important areas of international cooperation between LDCs and other countries in the global economy. These interdependencies and inter-linkages are now becoming more apparent than ever before. For instance, it is now being acknowledged the impact of trade openness and lower trade barriers (through liberalization, promotion of FDI and other measures) on economic growth is contingent on other pieces of a bigger developmental puzzle to fall in place. As Rodrik (1999:

13) notes, "Countries whose economies grow fast typically also become more open; but the converse progression — from greater openness to faster growth is much less apparent."

These other pieces of the puzzle include appropriate technology and industrial policies, infrastructure expansion, availability of human capital, financial investment, and appropriate policies and institutional capacity. Investments in infrastructure, especially in the industrial sector, have significant growth-enhancing effects in countries at lower levels of development (Ocampo and Vos, 2008). In the absence of this, investments in human capital alone, without corresponding changes in the productive structure to create demand for the skills acquired, carry the danger of knowledge flight through emigration (Ocampo, et al., 2007: 200; *LDC Report 2007,* ch. 4).

The new knowledge architecture needs to support the mobilization of domestic resources to strengthen local institutions for promoting learning based on local knowledge, infrastructure and human skills.

The new knowledge architecture therefore needs to support the mobilization of domestic resources to strengthen local institutions for promoting learning based on local knowledge, infrastructure and human skills, for three main reasons (Archibugi and Pietrobelli, 2003):

- The local capabilities that determine a country's potential for knowledge use and acquisition are not easily built or cheaply replicable;
- The tacit component of knowledge continues to be elusive, and less easy to transfer and replicate in a different context; and
- The innovative core of firms worldwide is moving from trading in embodied innovations to disembodied ones, where technological expertise is coded in terms of managerial and organizational specializations, and technological innovations are safeguarded through IPRs and trademarks. In this context, merely locating production within a country might not lead to significant knowledge "spillovers".

Faced with a lack of appropriate institutional support that could foster complementarities between different sources of learning as required for production activities, LDCs suffer from an absence of "institutional density" that could stimulate technological progress (Amin and Cohendet, 2000). ISMs should therefore seek to foster the creation of institutional mechanisms for and within LDCs that address this gap, such as knowledge networks, technology districts, joint ventures and/or knowledge-intensive business services (Antonelli, 2005). Such mechanisms may be established both within markets and in hierarchies (firms), or as hybrid initiatives. By fostering such accommodation of the dualistic nature of knowledge, ISMs would provide instruments that can accommodate both cooperation and competition. Knowledge-based networks encourage learning and stimulate scientific and technological development in a climate of constant change and growing internationalization of scientific-based economic activities. Learning can be promoted through markets, hierarchies or networks, but ideally all three coordination mechanisms should be working simultaneously.

The developmental State plays an important catalytic role in removing the binding constraints on technological learning so that the advantages of openness can be realized.

(d) Supporting the emergence of a learning-oriented developmental State

The developmental State plays an important catalytic role in removing the binding constraints on technological learning so that the advantages of openness can be realized. Previous *LDC Reports* have suggested that greater intervention is required to channel capital and entrepreneurial leadership to nascent industries, and at the same time, more interventionist and comprehensive ("big push") measures must aim to reduce domestic consumption and increase savings. The required catch-up cannot be expected

to occur by market forces left to themselves; it also requires proactive policies, State guidance and institution-building — in other words, a developmental State. The learning-oriented developmental State facilitates and champions technological learning, mitigating the costs through both market and non-market interventions for the generation of domestic knowledge and learning activities.

The State, through the promotion of development-oriented industrial policies, is pivotal for inducing a virtuous cycle of long-term economic growth based on the development of productive capacities through all possible means.

This process involves explicit industrial policies that give priority to learning activities both within firms and in the wider context of innovation within the country, in addition to the importation of technologies. The State, through the promotion of development-oriented industrial policies, is pivotal for inducing a virtuous cycle of long-term economic growth based on the development of productive capacities through all possible means. To this end, technical progress and innovation capacity will be of utmost importance (*LDC Report 2009*; Kozul-Wright and Gehl Sampath, 2010). More and more countries are beginning to adopt such an approach to industrial policy in order to jumpstart growth of productivity and employment. Technological progress is important for the development of new types of consumer goods, machinery and technologies to respond to newer patterns of consumption that accompany rising incomes. The application of new techniques of production or the adaptation of existing techniques to local contexts will spur greater productivity, employment and competitiveness.

This new and important role of the State needs to be supported through ISMs that enable the LDC State to use existing policy space within international agreements to promote knowledge- and technology-sharing in ways conducive to their economic development and social needs. State intervention, supported by ISMs, would be critical to ensuring the "strategic integration" of LDCs into world markets, while allowing some policy autonomy and insulation from external systemic pressures. In such a new knowledge architecture, the State's role is palpably different: from merely directing, to actively enabling learning processes and collaborations. Clearly, as noted earlier, the experiences of the earlier industrializers provide useful lessons for latecomers in initiating their own process of industrialization through learning. However, this does not imply simply imitating their technological growth process; it also means configuring new and context-relevant "institutional instruments". In this new role, the State articulates the links between science, technology and economic activities through networking and collaboration, and fine-tunes the learning components (education, R&D, labour training) into an integrated development strategy (Amsden and Chu, 2003).

In this new role, the State articulates the links between science, technology and economic activities through networking and collaboration, and fine-tunes the learning components into an integrated development strategy.

This perspective represents a crucial departure from the standard discourse on technological progress relating to the so called "equality assumption" – the little- discussed but ubiquitous premise which underlies the dominant economic paradigm, that all economic activities are essentially the same, implying that economic structure is irrelevant. From our perspective, however, changes in economies' productive structures are essential in order to generate growth in economic activities, characterized by increasing returns, dynamic imperfect competition and rapid technological progress. However, not all economic activities are drivers of growth. For example, commodities and agricultural activities, which tend to be characterized by decreasing returns to scale, low productivity, low value added and low rates of formal employment, are less likely to drive such a growth process. Different economic activities transmit different learning patterns and knowledge spillovers. Economic activities that drive dynamic growth are those that are reflected in the ability to absorb innovation and new knowledge, which enables increasing returns

to scale. History shows that successful growth episodes entail not only rapid capital formation (investment) but also proactive policies for "transferring and mastering skills and above all, creating a viable market…" (Ocampo, et al., 2007: 209). Therefore, there is a case for intervention by LDC Governments to enhance the efficiency of markets through various institutional means (Stiglitz and Greenwald, 1986).

2. How article 66.2 of the TRIPS agreement can work for LDCs

The purpose of the obligation under Article 66.2 is to ensure the transfer of technology to LDCs in order to help LDCs upgrade their 'technological base', as opposed to just supporting their scientific development. Scientific cooperation, training and education that is not accompanied by specific technological components,, although important for LDCs, do not sufficiently meet the obligation set out in the provision. In particular, "science" is not to be confused with "technology" and technological know-how, which involves a series of strategic and purposeful actions to help build a country's knowledge base and innovation capabilities. Despite the fact that in certain high-tech disciplines (such as biotechnology) the boundaries between science and technology seem to have blurred somewhat, scientific training is neither of direct commercial orientation, nor does it result in industrial application in the absence of capabilities.[9] The experience of a number Asian countries has shown that access to technology may provide the basis for technological upgrading at the initial stages of industrialization, while a scientific base is developed to support later stages as and when scientific inputs become more critical.

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In addition, since Article 66.2 belongs to a treaty that specifically deals with technologies protected under IPRs, the technologies referred to cannot be limited to those in the public domain they should also include those protected under various forms of IPRs. Developed countries have used a vast array of incentives to promote diverse production and technological activities, including tax exemptions of various types, financial support, preferences in government purchases and technical assistance. In addition, the WTO Agreement on Subsidies and Countervailing Measures (SCM) allows the use of R&D subsidies, subject up to a temporal limit,[10] and, in the same vein, WTO members are not prevented from creating incentives for R&D specifically aimed at generating technologies for LDCs, or for transferring existing technologies through licensing and other disembodied means.

This Report suggests that the discourse on technology transfer and what it entails should be based on a clear understanding that technical progress depends upon the availability of a wider range of competencies in LDCs between incremental innovation to R&D-based activities, in a simultaneous way. Technology transfer under Article 66.2 should be focused on expanding the reach of LDCs to technologies across the gamut of competencies (from reverse engineering, to incremental innovations, to R&D-derived new technologies) in all sectors, and should be accompanied by the associated know-how. The provision and its mandate should be construed as promoting a greater balance of existing IPRs with the need to share them more widely and make them accessible to LDCs. Developed countries should actively take part in not only setting up incentive structures for firms in their countries to engage in such transfers of technologies, but also set up monitoring and reporting mechanisms to record transfer of technology experiences. In addition to such a definition, which corresponds to the knowledge needs of LDCs, realizing the

Technology transfer under Article 66.2 should be focused on expanding the reach of LDCs to technologies across the gamut of competencies (from reverse engineering, to incremental innovations, to R&D-derived new technologies) in all sectors, and should be accompanied by the associated know-how.

objective of Article 66.2 requires the establishment of concrete institutional initiatives. Previous suggestions in this regard have included technology consortia and patent pools (Correa, 2007). Some of the ISMs listed in the next section could also be used to realize the goals of Article 66.2. In addition, a mechanism could be set up to enable the sharing of experiences in best practices in technology transfer, and encourage accountability and greater dissemination.

Realizing the objective of Article 66.2 requires the establishment of concrete institutional initiatives.

Initiatives for technology transfer should also include the transfer of horizontal technologies, such as for the implementation of technical standards, metrology, testing and quality control, project feasibility and management. This assistance may be provided by some international organizations, such as UNCTAD, the United Nations Industrial Development Organization (UNIDO) and WIPO, in addition to national institutions.[11] Such technical assistance will have a greater impact if based on some agreed common principles, as suggested in box 13 below.

Box 13. Principles for IP-related technical assistance to LDCs

Development-focused international technical cooperation requires the provision of technical assistance aimed at helping LDCs achieve the Millennium Development Goals (MDGs). It should also aim at helping LDCs integrate their technological regimes into their IPR, innovation and industrial policies. Such technical assistance should be guided by the following principles:

Creation of comprehensive and coherent assistance programmes. Technical cooperation should assist countries in devising coherent national IPR policies that are linked to broader development and public policy objectives. The existence of such policies should be recognized as a necessary part of developing a coherent approach to the implementation of international IP-related commitments.

A focus on an integrated approach. Technical assistance programmes should be designed to include training in matters relating to the use of competition law and policy to address potential abuse of intellectual property and practices that could unduly deter trade and the transfer and dissemination of technology and innovation.

Neutral, unbiased and non-discriminatory approaches. The provision of technical assistance should be unbiased, neutral and development-focused. It should be of an advisory nature based on actual and expressed needs, and should not discriminate between recipients or issues to be addressed. Moreover, it should not be perceived as being a reward system for supporting certain positions in international negotiations.

Assessment-based criteria. Recommendations should be based on a thorough assessment of the potential positive and negative socio-economic effects of IPRs, including their impact on GDP, dissemination of technologies, access – especially by the poor – to the outcomes of foreign and local innovations, transfer of rents (via profits and royalties) and affected social groups and sectors.

Full use of TRIPS flexibilities. Technical assistance should inform LDCs about the flexibilities allowed by the TRIPS Agreement (e.g. parallel imports, compulsory licensing, definition of patentability standards and exceptions to exclusive rights) and the advantages of incorporating them into national legislation. It should also inform LDCs about the negative implications of accepting TRIPS-plus obligations in RTAs.[a]

Full use of flexibilities outside the TRIPS. Technical assistance should also inform LDCs of flexibilities other than the TRIPS flexibilities, including the use of utility models to the protect innovations of small and medium-sized enterprises that could be of use to LDCs.

Source: Correa, 2007.

a In February 2007, the third session of the Provisional Committee on Proposals Related to a WIPO Development Agenda (PCDA) agreed a set of criteria for development-oriented technical assistance. Among other criteria, it was agreed that "WIPO technical assistance shall be, *inter alia*, development-oriented, demand driven and transparent, taking into account the priorities and the special needs of developing countries, especially LDCs, as well as the different levels of development of Member States, and activities should include time frames for completion. In this regard, design, delivery mechanisms and evaluation processes of technical assistance programmes should be country-specific" (see Summary by the Chair of the PCDA, at: www.wipo.int/edocs/mdocs/mdocs/en/pcda_3/pcda_3_summary.doc).

3. LDC-specific International support mechanisms for technology and knowledge sharing

The search and acquisition of technologies marks the beginning of knowledge use, dissemination and adaptation processes that form the basis of what is broadly understood to be "technological learning". Innovation, therefore, is at once a discovery and a search process; it is not composed entirely of radical discoveries, but refers also to the interactive process of economic application of knowledge in production. Most often this occurs by actors in LDCs acquiring technological knowledge or learning, and adapting products, processes and organizational practices that are already in use in other parts of the world. But it can also include "new to the world", "bottom of the pyramid" type innovations of products and processes, which meet the previously unmet needs of the poor.

It is through innovative activities that LDCs' economies can move away from their strong dependence on primary commodities and low-skill manufacturing.

Improved productivity, higher local value-added, increased competitiveness, better quality products and the introduction of new activities into an economy all depend on a myriad of small and large innovative activities. And it is through these innovative activities that LDCs' economies can move away from their strong dependence on primary commodities and low-skill manufacturing. It is also through these innovative activities that substantial poverty reduction can occur — though the relationship between technological change and poverty reduction is complex. It depends on the labour intensity of the technologies and on the economy-wide processes of creative destruction whereby employment opportunities decline in some sectors while they expand in others through technological change.

Technological knowledge that forms the core of this exercise exhibits several attributes that are localized and globalized at the same time, including the ways and means of creation and dispersion of tacit knowledge, the cumulativeness of knowledge systems and the path dependence of institutions in shaping the knowledge patterns of countries. A knowledge base is developed, maintained and disseminated through local knowledge systems that are embodied in the myriad of interdependent knowledge institutions within a country (*LDC Report 2006*). At the same time, the local knowledge system is routinely influenced by global-local knowledge interfaces — a term that denotes the global influences that impact upon the external knowledge sources which localized firms/organizations can tap into, the collaborations that can be formed, the synergies that can develop from such collaborations and the markets that can be expected for local products, but which at the same time are also influenced by a range of global factors.

The local knowledge system is routinely influenced by global-local knowledge interfaces.

International economic opportunities, as part of global trade, investment and other forms of multilateral and bilateral transactions between LDCs and the global economy, are therefore crucial to LDCs in their endeavours to build technological capabilities. They facilitate and provide newer global-local knowledge interfaces on a routine basis. Using these opportunities to promote innovation is central to developing productive capacities in LDCs, and essential for fostering structural change and diversification away from commodity dependence. This is even more important in view of the deep trade liberalization which most LDCs have already undertaken and as global competition becomes increasingly knowledge-based. Innovation will also be central to adaptation to climate change and the transition to a less carbon-intensive growth path. Yet, at present, donors have little idea about how to use aid effectively to promote science, technology and innovation in the LDCs.

This Report proposes new ISMs that should work towards the gradual realignment of incentives provided under the global IPR regime with the development needs of LDCs by promoting knowledge sharing, while at the same time strengthening the local innovation capabilities of LDCs.

Some ISMs currently exist to address the need for technology transfer and knowledge sharing in LDCs and ODCs. Product development partnerships, especially in pharmaceutical innovation and food crops, are good examples of innovation initiatives aimed at creating public goods of relevance to LDCs in addition responding to needs for technical know-how (Maskus and Reichman, 2004). Recent literature suggests that similar ISMs could be applied to emerging areas of importance to LDCs and ODCs, such as the development of climate change technologies (Maskus and Okediji, 2010 forthcoming). However such ISMs seek to compensate for the shortcomings in the global IPR regime, and aim, in particular, at meeting the pressing needs for innovative products and services for the poor, such as health and access to medicines and food security and nutrition.

This Report proposes new ISMs to respond to the growing knowledge divide. Such ISMs should work towards the gradual realignment of incentives provided under the global IPR regime with the development needs of LDCs by promoting knowledge sharing, while at the same time strengthening the local innovation capabilities of LDCs. In bridging the knowledge divide, the ISMs should play a key role in two respects. They should support LDCs in building local technological capabilities by addressing some of these countries' key institutional weaknesses that pose a challenge to firms and organizations operating there (see box 14). They should also endeavour to seek options that would facilitate technological catch-up in LDCs outside the

Box 14. Institutional limitations to technological learning in LDCs

Previous *LDC Reports* (2006–2009) have addressed in detail three sets of *institutional and inter-organizational limitations* that impede technological learning in LDCs. These are summarized below.

(i) Insufficiency of investments in technological learning

Learning opportunities for innovation may arise from a variety of sources, such as investments in new machinery and equipment, technology suppliers, mobility of labour and interactions with other knowledge agents (e.g. other firms, formal R&D units within enterprises, R&D business associations). In addition there can be some external sources, such as contract manufacturing for exports and supplying to global value chains. However, learning does not occur automatically or without costs – policy and institutions matter. As the *LDC Report 2007* noted, the opportunities for industrial learning in LDCs have been quite limited due to their institutional shortcomings in providing adequate physical and knowledge infrastructure and incentives to engage in a collective learning process with others.

(ii) Lack of a supportive environment for innovation

There is an urgent need to mobilize domestic resources to build greater physical and knowledge infrastructure, and to create financial instruments that reduce innovation-related risks in LDCs. This includes gradually reviving public sector activities in applied research and industrial R&D, and supporting the emergence of a strong local enterprise sector. In the absence of this, *access to knowledge will at best remain simply access to information* owing to the lack of capabilities of local actors to build further upon it. In an effort to mobilize greater domestic resources for innovation, it would be desirable to set clear targets and quantity of domestic resources that will be invested as part of national strategies for science, technology and innovation to improve the domestic learning environment.

(iii) Lack of sufficient support to the enterprise sector to learn and innovate

Apart from a set of standard constraints, such as risk and uncertainty of engaging in product development, access to a skilled labour force and weak technological capabilities, three major sets of constraints on enterprise innovation are evident from newer studies on latecomer countries (see, for example, Gehl Sampath, 2010; and Oyeyinka and Gehl Sampath, 2010). The first relates to the scale and scope of public sector funding aimed at building capabilities to exploit technology and generate innovation. This concerns both domestic R&D and pilot and design-related activities for eventual commercialization. The second dimension relates to the scale of capabilities in the private sector, which equally lags behind, primarily due to limited access to credit to expand and engage in newer forms of product and process development. Finally, firms rely on extension services for standards setting, testing, metrology, quality control, information, IPRs, and vocational, technical and skills training. These services, usually provided by a network of public and private research institutions, need to be strengthened within LDCs. By focusing on provision of these services, ISMs could offer much-needed support in helping firms in LDCs to expand, grow and innovate.

Source: *LDC Reports,* 2006–2009.

ambit of the TRIPS Agreement and the ongoing discussions on IPRs. This includes, for example, the use of utility models to support local innovations and the innovative use of tariffs to promote local industry.

The ISMs presented below are expected to help the new global knowledge architecture move towards a gradual reorientation of the basic principles on which technology issues for LDCs are construed, thus offering a firmer basis to implement other existing ISMs as well. These ISMs could be applied across sectors in all LDCs, and should also be considered in the context of ongoing international negotiations in the WTO and WIPO. They could be used by the international community and/ or the LDCs themselves as part of regional integration strategies for technological change and knowledge sharing, and as modes of South-South Cooperation. They could also be used in triangular cooperation between LDCs, ODCs and the international donor community.

For the dissemination of technologies and knowledge required for catch-up growth in LDCs, an important market-based initiative could be the setting up and supporting of technology-sharing consortia.

The ISMs proposed here include: creating a technology sharing consortia for innovation in LDCs; a technology licence bank; a multi-donor trust fund for financing enterprise innovation in LDCs; and a diasora network to pool LDC talents from abroad.

(a) To create a technology-sharing consortia for innovation in LDCs

For the dissemination of technologies and knowledge required for catch-up growth in LDCs, an important market-based initiative could be the setting up and supporting of technology-sharing consortia, or what are also called technology or knowledge commons. These are superior, in efficiency terms, to individual firm-based proprietary knowledge and technology generation and use. A technology consortium refers to a group of firms that agree on a particular set of terms to share one another's current or future innovations so that each firm in the consortium benefits from the combined innovation activities of the entire consortium. Joint adaptive research and exchange of technology (rather than through pure licensing) would provide firms in the consortium with a degree of protection against free-riding, and could nurture and facilitate the greater use of new technological knowledge by enterprises in LDCs. Based on the voluntary exchange of technology among firms involved in similar activities, the consortium would encourage technological cooperation among independent business firms. This collaboration would lead to faster rates of adoption of new and superior technologies and faster rates of diffusion than via pure licensing arrangements.

A technology consortium can generate welfare benefits for its members by facilitating a wider and more rapid diffusion and adoption of innovation.

A technology consortium can generate welfare benefits for its members by facilitating a wider and more rapid diffusion and adoption of innovation. The sharing of information will reduce the incentives for individual firm-based R&D investment. Technology consortia are characterized by inherent incentives to increase, rather than decrease R&D expenditure, as they internalize the externalities of innovation. In order to trade technology, a firm would need to have sufficient internal capacities and technological information of its own to offer in exchange. Hence, there is an inherent built-in incentive for increased R&D outlays by individual firms. In that way, information sharing will increase profit-maximizing spending on innovation, and the cost of saving will in turn increase profit maximization per unit of output per firm.

Market incentives for a technology sharing consortium. Proprietary technology (that can only be obtained from a monopolistic supplier) represents a bottleneck input for most firms. A consortium can help to shield its members from excessive external competition. Firms will not have to rely purely on their own R&D because the consortium will be able to offer a market competitive advantage to its members. This can be socially beneficial, as it

would internalize the externalities involved in the innovation process, thereby adding to the incentives for innovation. At the same time it would help speed up the dissemination of innovations and catalyse the retirement of obsolete technical processes.

Policy incentives should be designed to offer resources to firms which opt for inclusion in the consortium, and a degree of protection against the risk and uncertainty associated with the financing of any innovative activity.

Policy incentives should be designed to offer resources (from currently uncoordinated aid resources) to firms which opt for inclusion in the consortium, and a degree of protection against the risk and uncertainty associated with the financing of any innovative activity. Such financial resources would be aimed at promoting R&D, primarily adaptive research based on foreign technologies to suit local conditions. Schemes for financing could be designed in a way that offers firms a number of fiscal and investment incentives, specifically to induce them to engage in collaborative R&D at a much higher level than would normally be the case in the LDC context. Such consortia could be created at the national or regional levels comprising only of LDC firms (not including MNCs based in LDCs).

(b) A technology licence bank

Firms in LDCs find it difficult to search and acquire knowledge about appropriate technologies. A technology licensing bank could address these issues by acting as a licensing pool for technologies.

The trend of proliferating patents in industrialized countries, especially in high-technology sectors, and the use of IPRs as strategic assets to prevent wider access to knowledge inputs lead to a skewed and unfair distribution of future opportunities for firms in LDCs and ODCs. Not only do firms in LDCs find it difficult to search and acquire knowledge about appropriate technologies, they are also ill-equipped to negotiate licences and licensing fees for the technologies in question, as they lack the requisite managerial and legal expertise. In terms of both new and traditional technologies, search and bargaining costs of acquiring technology licences can be extremely high. LDC firms also lack information on the various kinds of similar technologies available, and their relative costs and merits, all of which affect their ability to make informed choices.

A technology licence bank could address all three of these issues by acting as a licensing pool for technologies. It would offer LDC enterprises technology licences for use of the technologies in the pool. These licences would not be free of cost; they would be subsidized through funds provided either by the LDC Governments or by donor agencies, or by both jointly. The licence bank could also provide a database of technologies and inventions, along with details of supplier firms, their relative merits and licensing costs, thereby creating a much-needed service for firms and organizations in LDCs. A third function of the bank would be to act as a clearing house for the licensed technologies, thereby reducing bargaining asymmetries between firms in developed countries and those in LDCs. It is envisaged that such a technology licence bank is especially useful to promote publicly funded innovations/technologies and environmentally sound technologies.

The licensing bank would provide licences not only for patented products, but also for products that are protected through other forms of intellectual property, thereby covering a wide range of sectors and firms.

To encourage firms in the industrialized countries to participate in the technology licence bank, the bank would pay them fees at the market rate of licensing, in addition to committing to adhere to internationally agreed standards of IPR protection. The firms from the industrialized countries that participate in the licence bank could also receive a label (similar to eco-labelling) certifying that the enterprises are "pro-development". This label could be used by the firms to gain goodwill from global markets, similar to "fair trade" labels. The Bank would cater only to LDC-local firms (including joint ventures with local equity component of over 60%) and not to transnational companies based in LDCs. Firms from LDCs that express intent in participating in the licence bank would be subsidized according to

their ability to pay. Towards this end, the bank would set a series of financial thresholds to determine the amount that LDC firms should be charged for use of the technologies in the licensing pool.

The proposed technology licence bank would be different from patent pooling in two important respects. The licence bank would provide licences not only for patented products, but also for products that are protected through other forms of intellectual property, thereby covering a wide range of sectors and firms. Second, the licence bank would not rely on the altruistic motives of firms in industrialized countries. The firms that own the licences would stand to gain from the goodwill generated by "pro-development" labelling, in addition to receiving the market price for the licences.

The International Spark Initiative is an ISM aimed at financing enterprise innovation in the LDC.

(c) The International Spark Initiative: A multi-donor trust fund for financing enterprise innovation in LDCs

This ISM, aimed at financing enterprise innovation in the LDCs, would involve the setting up of *national* technology/innovation funds which would be *internationally* financed through official aid, and/ or private foundations or sovereign wealth funds. It would initially target those LDCs which have developed a coherent strategy for science and technology and innovation (STI) to boost development, and which are able to establish the necessary national institutional infrastructure to manage such funds. For reasons that become clear below, it is proposed to call this initiative, the International Spark Initiative.

It would involve the setting up of national technology/ innovation funds which would be internationally financed through official aid, and/ or private foundations or sovereign wealth funds.

Since enterprise innovation is the backbone of successful industrial development in LDCs, the proposed ISM would provide a policy, financing and institutional framework for rectifying the weakness of the enterprise sector in LDCs in this area. This would involve devising innovative uses of official development finance which, as argued in chapter 5, should be elaborated with equal vigour as the search for innovative sources of finance. The proposal presented here would build on existing best practices in financing enterprise innovation, both in developed and developing countries, and would seek to avoid the dangers of aid fragmentation through the establishment of some kind of new vertical technology fund for LDCs. By including a technology transfer dimension in the initiative, it would also be possible to contribute to the implementation of Article 66.2 of the TRIPS Agreement. Moreover, the initiative could be considered as an element of aid for trade, with the focus being not simply on greater facilitation of existing trade flows, but also on the creation of new trade flows by building export competitiveness.

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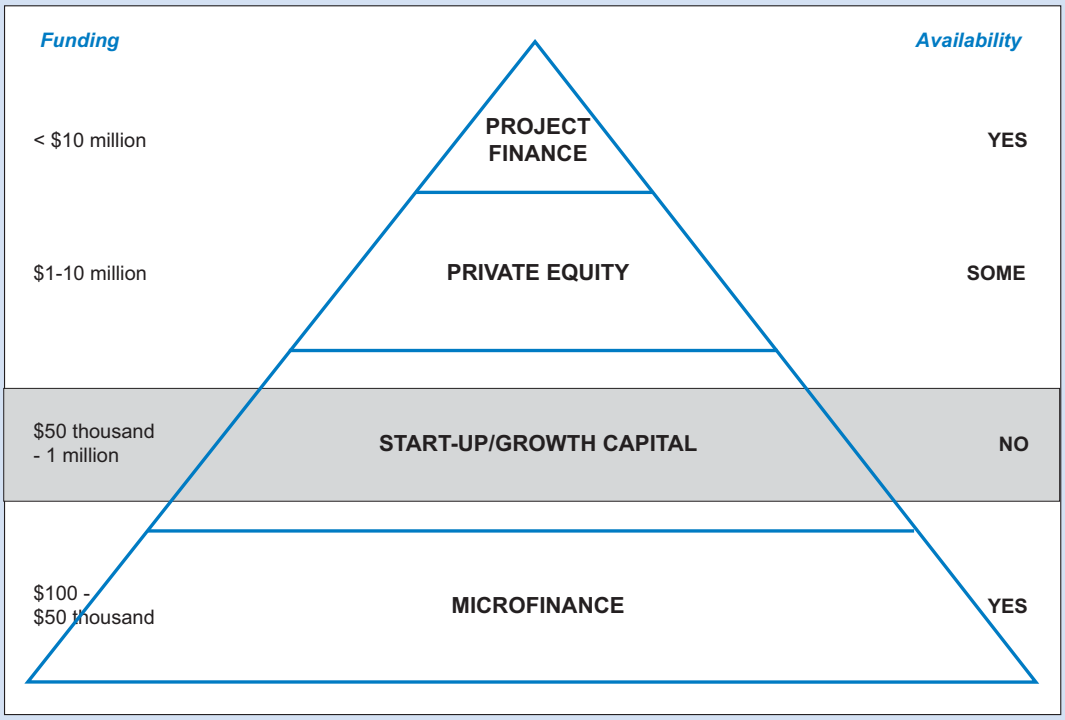
The current policy gap and rationale for special support for financing enterprise innovation. At present it is possible to identify three areas of donor discourses that are pertinent to this issue: (i) private sector development, (ii) increasing access to finance, and (iii) aid for science, technology and innovation (STI). However, each of these policy areas has weaknesses with regard to the financing of enterprise innovation.

The strategic focus on increasing access to finance has been on micro-credit and deepening capital markets. Thus there is a critical gap in access to enterprise finance for the few firms in the "missing middle" of the enterprise structure (chart 37).

With regard to private sector development, a wide array of instruments is available (chart 38).

Chart 37

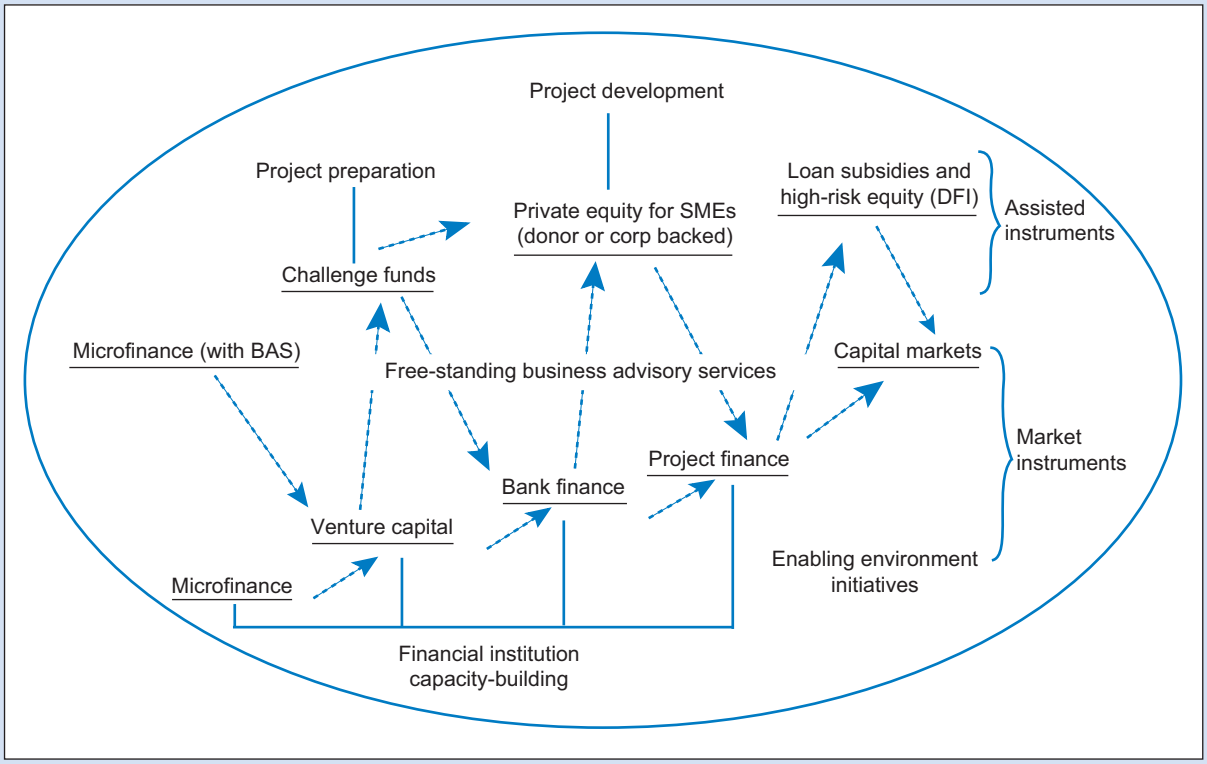
Access of enterprises to finance in Africa



Source: ODI, *Directions for Private Sector Development Instruments in Africa: 8 Strategies for the Policy Maker,* June 2005.

Chart 38

The mosaic of private sector development (PSD) instruments



Source: ODI, *Directions for Private Sector Development Instruments in Africa: 8 Strategies for the Policy Maker,* June 2005.
Notes: BAS: business advisory services; DFI: development finance institutions.

However, in general, advice on best practices for donors indicates an aversion to direct support of domestic enterprises except in special circumstances. There is a much greater focus on: (i) improving the overall investment climate, (ii) seeking to find ways to diminish the information asymmetries which dissuade commercial banks from lending, and (iii) provision of business support services.

While donor approaches to increasing access to finance and private sector development overlap, there is no connection between these discussions and aid for STI (chart 39).

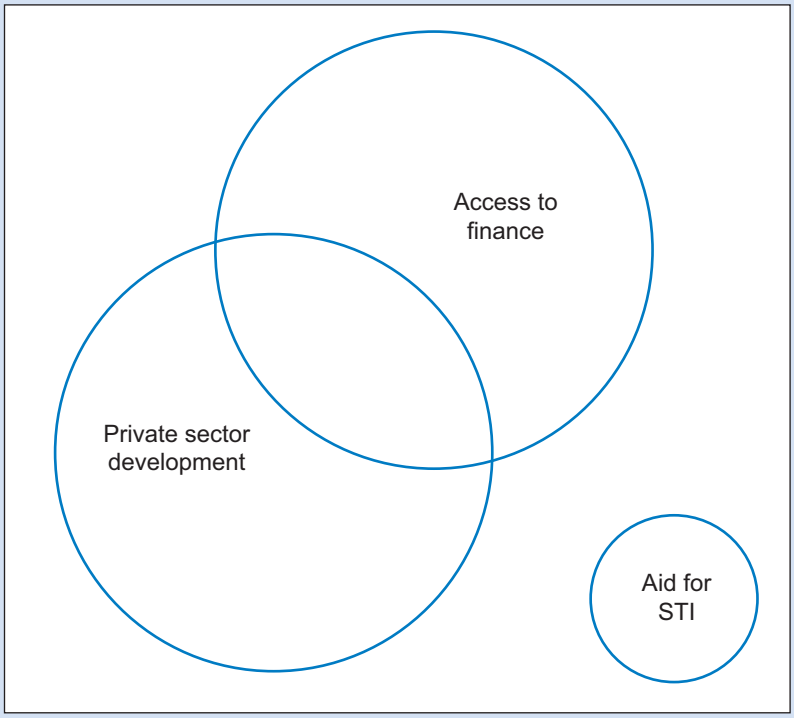
Donor practices in the area of aid for STI are very underdeveloped: any increased aid for STI to LDCs seems to be directed mainly to universities, rather than supporting innovation by either firms or farms (UNCTAD, 2007). This is a major blind spot, which offers an important opportunity for improving aid effectiveness. Some aid agencies are starting to enter this area. For example, the German aid agency, GTZ, is actively exploring ways and means of promoting innovation through a systems approach. And Agence Française de Développement recently co-organized a competition with the Bill and Melinda Gates Foundation and the World Bank, which is seeking both innovative sources and uses of development finance, including innovation financing to catalyse enterprise investment (see www.fininnov.org). In addition, the World Bank, following its Global Forum on STI Capacity-Building Partnerships for Sustainable Development in Washington, DC, in December 2009, is exploring the possibilities of creating innovation funds.

Donor practices in the area of aid for STI are very underdeveloped: any increased aid for STI to LDCs seems to be directed mainly to universities, rather than supporting innovation by either firms or farms.

As noted above, there is some degree of reluctance amongst donors to use aid directly to finance enterprise development under the current policy paradigm. Yet, paradoxically, almost all developed countries have themselves

Chart 39

Different domains of donor practice in financing enterprise development



Source: UNCTAD secretariat.

set up special institutions and funds for financing enterprise innovation. This policy is based on the recognition that there is a so-called "valley of death" in early-stage innovation financing, which means that ideas that are potentially of great economic and social benefit do not come to fruition because of the commercial risks of introducing new products or services. The special institutions and funds provide grants and loans to rectify this specific market failure. Some developing countries, such as Brazil and Chile, have also set up such funds, and they have become an important tool in their national development policies. In addition, China implemented a Spark initiative in the early 1980s, which aimed to promote innovation, particularly in town and village enterprises in small towns and rural areas.

Some developing countries, such as Brazil and Chile, have also set up such funds, and they have become an important tool in their national development policies.

The naming of the Spark Initiative points to an additional and fundamental reason why supporting finance for innovation is vital in the context of development: it offers "innovation externalities". At their simplest, such additionalities and externalities are apparent in the "innovation epidemics" which occur as new processes, products and practices catch on. This cumulative collective learning is expressed in the now familiar S-shaped innovation diffusion wave. However the real impact of innovation at the firm level comes when it generates structural change and economically dynamic multi-agent structures (such as production clusters) as well as a local culture of entrepreneurship. The aim of financing enterprise innovation in the context of development is to leverage such external effects to ensure that markets work more fully in promoting innovation.

The design of the International Spark Initiative. International financial support for enterprise innovation could be implemented through a global vertical (i.e. problem-specific) fund. Such funds already exist, such as the Global Fund to Fight AIDS, Tuberculosis and Malaria, the Global Alliance for Vaccines and Immunization (GAVI), the Education for All — Fast Track Initiative (EFA-FTI) and the President's Emergency Plan for AIDS Relief (PEPFAR). However, this approach is not advocated here. Global vertical funds tend to be attractive because of their visibility they provide a neat message for politicians, the media and the public and their ability to raise funds in specific areas. Proponents of such funds argue that merging vertical programmes has resulted in unprecedented amounts of money and attention to needy causes. However, these funds also increase aid fragmentation, reduce country ownership and weaken country systems. EURODAD (2008) also argues that, despite efforts to make global vertical funds "Paris-friendly", "there are still too many global programmes out there that operate in a vacuum….[and] the tendency to add more programmes, without fixing what already exists, is still too prevalent." (EURODAD, 2008:8). The approach being proposed here is therefore not a purely global vertical fund, but rather a hybrid which combines global and national elements. This is very much in line with an approach World Bank advocates in a paper prepared for the OECD Development Cooperation Directorate, which notes that "neither global programmes nor country programmes alone are a panacea to development assistance issues — they have to be conceived, designed and implemented in tandem." (OECD, 2006).

China implemented a Spark initiative in the early 1980s, which aimed to promote innovation, particularly in town and village enterprises in small towns and rural areas.

Following Teubal (2009), the design of a "benchmark" national technology fund for providing direct support to firms for commercial innovation would include:

- *A preliminary assessment* of needs based on statistics, interviews, case studies, focused surveys and benchmarking of similar programmes in other countries of a similar type.

- *Definition of objectives* which should encompass (i) the promotion of learning and creation of innovation capabilities – not simply technological, but also marketing, production, exporting and linking with partners and suppliers, (ii) promotion of entrepreneurship, and (iii) identification of areas of sustainable comparative advantage.
- *Identification of functions to be supported*. These could include technology transfer, design, engineering, learning and start-up time the utilization of new process equipment, training of the labour force, consultancy services and R&D. In an LDC context, it is important to be flexible about the functions being supported.
- *Specification of the size of the budget.* A technology fund should have at its disposal $10–$20 million per annum, since a minimum level of support is necessary to develop a critical mass of innovative firms.
- *Financing instruments*. Experience shows that "subsidies (loans or grants) have been found to be more effective than tax concessions" and "there are strong advantages from giving at least one-third of the subsidy up-front". Similarly, grants are better than loans because of high transaction costs and grants may be transformed into a conditional grant or conditional loan.
- *Horizontal or targeted programmes*. Horizontal programmes support a particular technological learning or innovation function (e.g. design or R&D), and are open to all firms in the business sector. This is simpler at the beginning, but where there are clear areas of sustainable comparative advantage, target programmes which aim to trigger innovation in the selected industry or technology are also relevant. Thus an evolutionary, hybrid approach is advisable (Teubal, 2009).

The fund should support different kinds of SMEs, including dynamic microenterprises in the informal sector.

Given the weaknesses of the private sector in LDCs, it is important that the financing mechanism be designed for bundling with various business development services.

The fund should support different kinds of SMEs, including dynamic microenterprises in the informal sector. The types of innovation to be supported should cover a broad spectrum of activities: equipment modernization, technology transfer from abroad, development of local technological capabilities, introduction of new materials, imitation, backward engineering, design, engineering, learning/training, and R&D. However, given the weaknesses of the private sector in LDCs, it is important that the financing mechanism be designed for bundling with various business development services. Part of the innovation process may involve technology transfer, which has its own specific challenges, and these could also be incorporated in the initiative. For example, SMEs in industrialized countries have untapped potential for technology transfer, but they need to be offered incentives, such as a subsidy to the transferrer, as market prices are not enough (Foray, 2009). But technology transfer TT will only be effective if it is accompanied by supporting the building of technology capability in the transferee.

The general approach would be oriented to increasing innovation and innovativeness in LDCs' economies, but the fund could also be designed to target specific innovation challenges as well.

Within this general framework, the International Spark Initiative could have different focuses. The general approach would be oriented to increasing innovation and innovativeness in LDCs' economies, but the fund could also be designed to target specific innovation challenges as well. An obvious example would be in the area of energy technologies which facilitate a transition to a low-carbon economy.

The implementation process and the financial challenge. An evolutionary approach to policy implementation is proposed, covering a few LDCs that have comprehensive strategies on STI issues. A pre-implementation phase would include planning and assessment of needs and possibilities, with an initial slow take-up and the emergence of snowball effects and collective

learning. Upon reaching a critical mass of innovating firms, the mechanism would need to be redesigned and other approaches to promoting innovation introduced. The role of the State would diminish over time, as market begin to perform the necessary functions.

Past experiences indicate that a commitment to the programme for at least five years is very important, and there also needs to be adequate funding so that the instrument is sustainable and credible to beneficiaries at the necessary level (Teubal, 2009). Weak implementation can lead to major problems of trust, which can have long-lasting negative impacts on government-business relations. Trust is critical for the successful implementation of the programme; failure could lead to disenchantment with innovation policies.

LDCs' diaspora can play a significant role in leveraging technical and managerial knowledge through various forms of involvement.

Two important elements in the design of the initiative should be: (i) the creation of a national innovation coordinator to manage the initiative at the country level, and (ii) the creation of a multi-donor trust fund, which would provide funds to the agencies involved. Some mechanism is needed to ensure the accountability of the national innovation coordinator, which may or may not be attached to a national science, technology and innovation agency or council, and does not necessarily have to be governmental. The involvement of non-State actors might increase credibility. The multi-donor trust fund model would provide a means for collecting funds. With regard to the funding of an initiative to finance enterprise innovation examples from Latin America show that it is possible to finance national technology funds through rents from natural resource sectors (e.g. oil, and natural gas royalties) or through dedicated sectoral funds. For example, a levy of 0.75–1 per cent of net income of enterprises that have concessions for the generation, transmission and distribution of electricity could be used to promote R&D in the sector. The establishment of technology funds by earmarking part of resource rents, or a mixed approach that uses resource rents matched by outside aid, could be effective approaches for LDCs.

(d) LDC talents abroad: Pooling the talents of the diaspora for knowledge-based activities

LDCs' diaspora can play a significant role in leveraging technical and managerial knowledge through various forms of involvement. Remittances to family and collective remittances to groups in crisis are relatively well-documented in the literature. Other important forms of diaspora assistance to leverage a country's development potential include investment in commercial enterprises (e.g. as in the software sector in India), providing political leadership (as in China), transferring important sources of knowledge for a country to develop — including documentation of acquired knowledge in local languages (e.g. technology acquisition in the Republic of Korea and the Ethiopian Diaspora Skills Bank) — providing leadership in public sector positions (as in Afghanistan) and finally leveraging tacit know-how in emerging sectors through employment in domestic firms (as in software and pharmaceutical firms in India).

However, while initiatives involving the diaspora are easy to launch, they are very difficult to sustain and promote in ways that contribute to their country's development. The difficulties in institutionalizing the diaspora makes their role, functions and specific contributions to development difficult to codify and list as a set of "best practices" for other countries to follow. Mostly, the engagement of the diaspora has occurred as a spontaneous response to a country's development (Kuznetsov, 2006). An exception is the Republic of Korea, where the diaspora played a critical role in the 1990s, returning from the United States to work for local firms (the *chaebols*) to

develop new technologies that were not being licensed by foreign firms. Most importantly, experiences confirm the fact that the engagement of the diaspora with a country depends mostly on that country's own institutions and ability to pool the talent from abroad and engage them in the development process. LDCs where the state of institutions and the low potential for engaging in highly skilled activities has led to a brain drain face a formidable challenge in attracting the return of the diaspora to contribute to knowledge growth in their home economies.

There is urgent need for an ISM that would help coordinate different types of diaspora and provide two essential services: the search and pooling of diaspora for LDCs, and seed funds to kick-start the engagement of people living/working abroad as part of knowledge sharing and technology transfer (especially tacit know-how). Such an ISM could be based on some recent empirical experiences on how to mobilize the potential of diaspora for LDCs. However, the design of the ISM would depend on the economic and political conditions of the country as well as the overall abilities of its diaspora (Kuznetsov, 2006). For example,

There is urgent need for an ISM that would help coordinate different types of diaspora and provide two essential services: the search and pooling of diaspora for LDCs, and seed funds to kick-start the engagement of people living/working abroad as part of knowledge sharing and technology transfer (especially tacit know-how).

- Unfavourable country conditions and a sophisticated diaspora: Establish demonstration projects (Kuznetsov, 2006: 233), as in Armenia.
- Unfavourable country conditions and a dispersed diaspora: Focus on individuals and on engagement in a broader policy dialogue for reform. The focus on individuals is important, since organized networks would be difficult to sustain in such conditions. Individuals who have achieved considerable professional success abroad should be pooled and engaged in development projects as well as in policy reform agendas and discourses.
- Moderately favourable country conditions and a sophisticated diaspora: Use the diaspora to initiative a move towards knowledge-intensive activities. In countries where growth is under way, the diaspora's strength and talents could be pooled to help overcome the binding constraints. For example, emerging niches within successful value chains could be used to attract diaspora talent and engagement in helping the country branch out into more knowledge-intensive activities.
- Moderately favourable country conditions and a dispersed diaspora: Seek to create diaspora networks and promote the return of diaspora in key emerging sectors.
- Favourable country conditions and a sophisticated diaspora: Use diaspora networks as a key resource for transition to a knowledge-based economy. This promotes a situation where the country's capabilities and the diaspora's contribution to the country combine in a virtuous way, coordinated through a variety of policy incentives that seek to integrate the diaspora into an emerging positive national identity. Examples include China, India, Ireland and Taiwan Province of China.
- Favourable country conditions and a dispersed diaspora: Countries that are growing but struggling to move away from a dependence on trade in commodities to more structurally diversified production modes could rely on their diaspora to promote knowledge and skills that are urgently needed to make this transition. Even small diaspora networks can make large impacts in leveraging knowledge from outside and coordinating the growth of tacit know-how within industry. Examples include Chile, where the Fondacion Chile has been actively engaged in harnessing diaspora talent to promote knowledge-intensive activities in local firms.

Notes

1 Such a policy was originally discussed in the context of the two-tier currency transaction tax – a modified Tobin tax – with a view to stabilizing currency fluctuations (Spahn, 1996; and Nissanke 2005).

2 Chile had accumulated good experience of following this budgetary rule in the 1990s, but the rule was formally adopted in 2001 with the new left-wing government taking a power, and the transparency of the operation has improved significantly since 2001 (Ffrench-Davis, 2010).

3 By late 2008 in Chile, the two stabilization funds combined had accumulated savings amounting to 18 per cent of the country's GDP, while fiscal liabilities were negligible following the significant amortizations of the previous fiscal surpluses (Ffrench Davis, 2010). With this level of accumulated savings, the structural surplus target was reduced to 0.5 per cent in 2008. As a result of the global economic crisis of 2008–2009, Chile moved to a 0.4 per cent structural fiscal deficit and to a 4 per cent measured deficit to allow a 15 per cent rise in fiscal public investment, and an increase in social expenditure during the recession that ensued.

4 The TNCs paid 0.6 per cent of gross revenue and a 25 per cent tax on exports, instead of the normal 2 per cent and 35 per cent rates, respectively, as stipulated in the Mines and Minerals Act of 1995. They also benefited from many generous tax exemptions (Jourdan, 2008).

5 For a discussion of recent developments in IMF and World Bank contingency financing facilities open to LDCs, see box 7.

6 Compensation for mineral products was administered under a separate facility called SYSMIN.

7 Most LDCs' tourism potential is based on natural resources such as fauna, flora and geomorphology (e.g. beaches and mountains) rather than on man-made attractions.

8 Romer (1990) has suggested that the public goods nature of knowledge is a derivative of the investment in search and innovation by firms in the process of developing new goods and services. However firms' search for knowledge takes place in an environment of so-called high appropriability for which IPRs, such as patents, are given. While firms' innovation outcomes represent private returns for those firms, the social returns could be a sufficiently significant pool of knowledge that is "free" to society.

9 The WTO Agreement on Subsidies and Countervailing Measures (in footnotes 26, 28 and 29 of the Agreement) makes a distinction between "fundamental research", defined as "an enlargement of general scientific and technical knowledge not linked to industrial or commercial objectives", "industrial research" and "pre-competitive development". The provisions of the Agreement do not apply to fundamental research activities independently conducted by higher education or research establishments.

10 Article 31 of the SCM Agreement establishes that the provisions, *inter alia*, of Article 8 "shall apply for a period of five years, beginning with the date of entry into force of the WTO Agreement. Not later than 180 days before the end of this period, the Committee shall review the operation of those provisions, with a view to determining whether to extend their application, either as presently drafted or in a modified form, for a further period". However, to date no decision on this matter has been taken.

11 Norway, for instance, has informed the Council for TRIPS about programmes with these objectives that are being undertaken by its bilateral aid agency, NORAD. NORAD is also "supporting several regional and national programmes leading to international recognition and acceptance of certification systems, both on multilateral basis as well as bilaterally. Some of these programmes also include financing of testing laboratories both for food export and particular industrial goods. Assistance is also given to exporters in developing countries and to development of quality and design of products in order to meet international marked requirements" (IP/C/W/480/Add.4, 13 October 2006).

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