Chapter 4

Adapting the Innovation Systems Framework to Sub-Saharan Africa

by

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This chapter discusses the structural realities of Sub-Saharan African countries and how they relate to the conversion of knowledge to value. It focuses on two central aspects of innovation in developing countries: the dominance of foreign investment in natural resources (particularly in extractive industries) and in infrastructure; and the large informal sector, which contributes about 41% to gross domestic product in Sub-Saharan Africa and represents around 72% of total employment outside the agricultural sector. It does not aim to provide an exhaustive analysis of these issues but to encourage discussion in an innovation systems perspective.

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Introduction

Innovative activities in extractive industries and infrastructure[1] occur for the most part in the formal sector. Foreign direct investment (FDI), particularly by multinational enterprises (MNEs), is often touted as the most viable channel for bringing foreign knowledge to developing countries (*e.g.* Lall and Narula, 2004; Lipsey and Sjoholm, 2005). Despite the obvious importance of FDI in extractive industries and infrastructure in much of Sub-Saharan Africa, empirical evidence on the role of FDI in strengthening innovation processes tends to focus on the manufacturing sector, when in fact, over the last 25 years the manufacturing sector has made a relatively small contribution to gross domestic product (GDP) in the region (UNCTAD, 2008a). There appears to be an underlying assumption that extractive industries and infrastructure have little to offer in terms of technological learning. It is not clear why this is so. The first section of the chapter focuses on this question.

The innovation systems perspective emphasises that firms are the primary locus of innovation. Although the informal sector is mainly composed of firms, it has been largely ignored in an innovation systems framework. Yet, many Sub-Saharan African economies have large informal sectors on which the vast majority of the population depends. While firms in the informal sector are generally micro and small enterprises and are somewhat unstructured, this does not mean that they do not innovate. Successful innovation in this context can result in benefits not only to informal entrepreneurs, but also to the society as whole; the informal sector in fact produces economically viable and beneficial innovations that affect a large proportion of the population. The isolation of the informal sector from the innovation systems framework, which is generally concerned with the formal sector, does not necessarily indicate that innovation is of limited relevance in the informal sector. The second section of the chapter considers this question and argues that it may be that adequate tools for understanding innovation processes within the informal sector may be lacking.

The role of extractive industries and infrastructure in innovation and technological learning in Sub-Saharan Africa

Extractive industries and infrastructure involve very different activities. However, the two sectors tend to be connected (*i.e.* extractive projects usually generate infrastructure around them) and they share a number of commonalities. Both are critical sectors in Africa, and both are strongly affected by FDI. The literature on innovation systems has emphasised the relationship between FDI intensity and the acquisition of technological capabilities in host countries, typically in the manufacturing sector. Despite the relevance of extractive industries and infrastructure and their intensive reliance on FDI, they are generally neglected in the innovation systems literature as a potential locus of technological capabilities.

A brief overview of innovation systems thinking on FDI, innovation and technological learning

The importance of FDI in the innovation systems framework can be traced back to its early development, when the main concern was its impact on the innovative performance of the host economy.[2] A vast literature based on the innovation systems perspective discusses the role of FDI in innovation and technological learning in developing

countries, particularly in Asia and Latin America.[3] It focuses primarily on the importance of developing an interface for innovation-related interactions that promote knowledge flows from MNE subsidiaries of developed countries to local firms in developing countries, particularly in the manufacturing sector (Rasiah and Gachino, 2004; Gachino, 2006; Goedhuys, 2007). More recently, attention has turned to interactions which lead to two-way knowledge flows in host developing countries (Marin and Bell, 2006). There is also increasing research on outward FDI from developing countries (*e.g.* UNCTAD, 2006a; Rasiah, 2008). However, the geographical focus of the theoretical and empirical research on developing countries has been uneven.

Discussions in Sub-Saharan Africa continue to focus on attracting FDI by providing favourable macroeconomic conditions and adhering to international trade regimes. Almost no attention is paid to the importance of encouraging innovation-related interactions. The implicit assumption is that the mere presence of MNEs leads to substantial knowledge flows to local firms. However, even in cases of production-related links between MNEs and host country firms, it cannot be presumed that innovation-related interactions exist. Moreover, such interactions vary widely across sectors.

The literature on the relationship between FDI and innovation in host developing countries focuses largely on the manufacturing sector in Asian and Latin American economies. While this can be the source of useful lessons, these developing countries are very different from those of Sub-Saharan Africa. In particular, they have far more extensive manufacturing activities. For example, between 2000 and 2006, the share of manufacturing exports in total merchandise exports was 92% in East Asia, 56% in South Asia and 54.5% in Latin America, but only 26% in Africa (UNCTAD, 2008b). Moreover, many developing countries in Asia and Latin America have industrial structures that are relatively well established and significantly well endowed in human resources.

Over the last few decades, intense global competition among MNEs has been concentrated in the manufacturing sector, with commodities produced and marketed on an international basis. However, the participation of Sub-Saharan Africa appears to have been relatively marginal, despite the existence of bilateral agreements such as the African Growth Opportunity Act (AGOA) which was intended to buffer the adverse effects of the termination of the quota system in textiles and clothing on Sub-Saharan Africa. Clothing and textiles exports to the United States from Sub-Saharan Africa are reported to have fallen by 26% with the removal of quotas on China's clothing and textiles exports (Kaplinsky and Messner, 2008).

Lall and Pietrobelli (2005) attribute the dismal performance of manufacturing industry in Sub-Saharan Africa to structural constraints, particularly in skills and physical infrastructure. At the same time, they observe that most FDI inflows target resource-based industries and infrastructure. They suggest that these FDI inflows do not signify much in terms of technology "in that much of the FDI is either in the primary sector, particularly petroleum, or in infrastructure" (Lall and Pietrobelli, 2005, p. 323). The literature on FDI in Sub-Saharan Africa tends to affirm that extractive industries offer host countries limited opportunities for technological learning. However, the basis of such affirmations is not clear. In fact, some very sophisticated technologies are developed and used in natural resource extraction, and a number of economies have derived significant technological benefits from investments in extractive industries (Bell, 2007).

A brief overview of inward FDI in Sub-Saharan Africa[4]

FDI in Sub-Saharan Africa is concentrated in the primary sector and infrastructure. The evidence indicates that increases in FDI inflows to Sub-Saharan Africa are driven by extractive industries, a trend that is expected to continue. Indeed, FDI trends confirm that FDI inflows to Sub-Saharan African resource-based industries have increased rapidly over the last few years (UNCTAD, 2007). This growth is driven by an expansion of activities in the oil, gas and mining industries by transnational corporations. FDI in natural resources is often associated with increased investment in infrastructure (UNCTAD, 2008a).

Sub-Saharan Africa's share of the world inward FDI stock has been fairly small and has declined steadily over the past two and a half decades to 1.1% over 2000-04, down from 2.4% in 1980-84 (UNCTAD, 2005).[5] Nevertheless, the small absolute flows have been very important. In 2008 inward FDI stocks represented a relatively high proportion of total GDP in a fairly large number of Sub-Saharan African countries (33.2% compared to 24.8% in developing countries as a whole). As Table 4.1 shows, FDI flows in Africa increased significantly from 2005 to 2008 despite the global financial crisis (from 17.8% to 29% of gross fixed capital formation [GFCF]). The main FDI recipients continue to be producers of natural resources, although the table indicates that FDI inflows vary greatly from year to year.

Table 4.1. Inward FDI in a selected number of Sub-Saharan African economies

	FDI stocks as a percentage of GDP			FDI flows as a percentage of GFCF		
Year	**1990**	**2005**	**2008**	**1990-2000 (annual average)**	**2005**	**2008**
Africa	*11.7*	*28.6*	*33.2*	*7.3*	*17.8*	*29.0*
Chad	16.2	76.5	62.5	14.9	50.5	43.7
Dem. Rep. of Congo	20.6	56.5	74.0	19.1	57.7	65.1
Equatorial Guinea	19.0	130.3	80.5	38.1	125.7	20.5
Mauritania	5.8	98.5	63.5	6.3	392.8	15.9
Mozambique	32.6	69.2	39.4	13.4	7.1	26.5
Seychelles	57.8	115.7	180.4	19.1	105.3	127.3
Zimbabwe	3.2	62.9	70.4	6.2	176.4	19.2

Source: UNCTAD statistics, *www.unctad.org/*.

FDI stocks in Sub-Saharan Africa are relatively insignificant in comparison to those of Asia and Latin America. In spite of the fairly similar shares of world FDI stocks in the developing regions between 1980 and 1985, Asia has received considerably larger shares over time. In fact, while Asia's share of the world's FDI stock increased from an average of about 9.4% to 14% between 1980-85 and 2000-05, Latin America's increased marginally from 7.4% to 8%, while Africa's fell from about 6.4% to 2.5%. Of course, it can be argued that it is the nature or quality of FDI rather than the amount of FDI inflows that matters.

The main concern regarding FDI should be the extent to which inward FDI can be expected to strengthen knowledge flows through innovation-related interactions that lead to greater innovative dynamism in the host country and in turn induce greater FDI inflows. Although macroeconomic conditions and the general business environment influence FDI inflows, it is an economy's innovative dynamism that determines the extent to which such flows are beneficial to the host economy in terms of knowledge flows (see Chapter 5).

The continuing surge in world demand for natural resources is expected to remain the driving force for FDI inflows in Sub-Saharan Africa. In addition, over the last five years, FDI in Africa increasingly targets the exploitation of natural resources not only by Western countries with historical ties but also by new entrants from Asia, particularly China. It may be argued that Chinese investments in Africa operate in a manner fairly similar to that of the "Western" multinationals that have traditionally dominated FDI in the region. Nevertheless, Chinese multinationals have a number of different characteristics, as they are generally state-owned, have relatively little aversion to risk, and have undertaken large investments in politically sensitive regions (Buckley, 2008). Increasing investments by new entrants requires further attention.

The growth of FDI inflows in the extractive industries is also leading to a rise in FDI in infrastructure. For example, in the Democratic Republic of Congo there are significant projects in both the mining industries (diamonds, cobalt and copper) and in infrastructure development. South African investments in Africa are mainly in mining and infrastructure. Some of the largest South African investments in Africa are in mining (*e.g.* gold mining in Ghana, copper and cobalt in the Democratic Republic of Congo) (Naidu and Lutchman, 2004). Eskom of South Africa is involved in the first phase of an infrastructure project to rehabilitate the Inga hydroelectric power station in the Democratic Republic of the Congo as part of the "Unified African Grid" (UNCTAD, 2005). In the telecommunications sector, the South African giants, Vodacom and MTN, are rapidly expanding the telecommunications infrastructure in West and East Africa (Kraemer-Mbula and Muchie, 2010; UNCTAD, 2005). It would be very important to find ways in which such major infrastructure projects can serve as levers for innovation and technological learning in host Sub-Saharan African economies.

The much needed development of infrastructure, the lack of which appears to be a major obstacle for the manufacturing sector, largely accompanies the growing investments in extractive industries. It is important to assess and understand the role played by the activities of MNEs in the sectoral orientation of activities in host countries. In a dynamic context, this could reveal opportunities for strengthening and exploring new channels for developing the technological capabilities of local firms in sectors that attract substantial amounts of FDI. Progressive diversification into activities that attract relatively small amounts of FDI (such as manufacturing) might then be considered.

FDI-related innovation and technological learning in extractive industries and infrastructure

The concentration of FDI is highly skewed in favour of countries rich in natural resources. Together, Angola, Equatorial Guinea and Nigeria accounted for over 50% of inward FDI stocks in Africa between 2000 and 2004 (UNCTAD, 2008a). These countries have in common considerable investments in the oil industry. The surge in world oil demand is attracting FDI to these countries and to other oil-rich countries. Examples are investments in oil exploration activities in the Ogaden region of Ethiopia, investments by

Total (France) and Pecten in Cameroon, and investments in gold and aluminium in Ghana (UNCTAD, 2007).

Mozambique is reported to have become a leader among FDI recipients in southern and eastern Africa. By 2000, South Africa accounted for 28% of FDI mainly through partnerships in major extractive industry and infrastructure projects; the United Kingdom accounted for 22% through its participation in the aluminium project (Mozal), and Portugal accounted for 19% mainly in the services sector (UNCTAD, 2001). On the whole, large MNEs have a strong presence in the primary industries (UNIDO, 2005).

Development issues that relate FDI to innovation and learning in extractive industries remain insufficiently understood in Sub-Saharan African economies. The above observations help to highlight the importance of refocusing discussions on FDI and technological learning in order to reflect the important role of extractive industries and infrastructure. The increased demand for natural resources and the changing dynamics of MNEs, particularly in view of the new entrants from other developing countries, offer opportunities to do so. New forms of integration are emerging between Sub-Saharan African countries and other southern countries such India, China and even South Africa. It would be important to understand the specific forms of opportunities for technological capability development in natural resource industries (specifically extractive industries) and infrastructure. The existence of such opportunities is evidenced, for example, by Australia's construction industry and the development of petrochemicals in Brazil.

What can be said about innovation and learning in extractive industries and infrastructure in Sub-Saharan Africa? The dynamics of learning are likely to be different not only between these sectors and manufacturing (the main focus of the innovation literature), but also within them – differences can be expected within extractive industries (oil, gas, minerals, coal, etc.). Other natural resource sectors (agriculture, livestock and forestry) are likely to display sector-specific learning dynamics. The latter have received relatively more attention in the literature that examines innovation and technological learning (Clark, 2002; Smith, 2005; Hall, 2005; Kiggundu, 2006).

In the agriculture sector, while food processing may be considered a manufacturing activity, it is a downstream activity of the food sector and boundaries between the two may be fairly fuzzy. Food processing firms often produce agricultural raw materials and thus are active in a primary sector which undertakes technologically intensive activities. These technological activities relate both to the production of seed and other agricultural inputs and to downstream activities such as quality assurance/food safety management systems at the farm level, which provide inputs for agro-business activities. In addition, these activities tend to use a relatively high proportion of local content. The technological learning opportunities that may arise from natural resources and agricultural raw materials processing industries through the use of local content should not be underestimated. As an example, the policy department in Canada, Agriculture and Agrifood Canada (AAFC), deals both with food production through agriculture and food processing in the manufacturing sector (*www.agr.gc.ca/index_e.php*).

The origin of the FDI in extractive industries and infrastructure may also imply differences in the dynamics of learning. For example, projects that involve bilateral funding from industrialised countries are often undertaken by MNEs from these countries, whereas international donor-funded projects are increasingly undertaken by MNEs from developing countries, particularly China. The growing expansion of South African MNEs in Sub-Saharan African economies may also result in differences in learning dynamics in host countries. In fact a UNIDO survey (2005) found that South

African investors spent more on employee training in African countries than other foreign investors. For instance, PetroSA, South Africa's national oil company, established a capacity-building agreement for the development of technical staff in Sudan. It sent South African technicians to Sudan and Sudan sent personnel to South Africa "for training to enhance their technical know-how". The joint venture was described as commercially beneficial for Sudan and for "obtaining the critical skills they need to develop their oil industry further" (*Business Report*, 2005, quoted in Kraemer-Mbula and Muchie, 2010).

Understanding the specific characteristics of learning in extractive industries and infrastructure, particularly in view of the changes in global dynamics, remains a challenge. It is also important to understand, for example, how extractive industries are evolving in Sub-Saharan African economies owing to the increasing need to develop techniques to reach deeper oil wells or to explore new zones, and what this means for technological learning. The many issues surrounding the non-renewable nature of this source of energy, coupled with concerns about climate change and interest in renewable sources of energy, increasingly shape the dynamics of the industry. The implications of these changes for innovation and technological learning in relation to FDI in Sub-Saharan Africa are insufficiently researched despite their obvious significance. Moreover, debates on the role of FDI and the development of technological capabilities in Sub-Saharan Africa would perhaps be more relevant if greater attention were paid to natural resources and infrastructure than to manufacturing.

The role of donors in the conversion of knowledge in developing countries

The knowledge-based economy and globalisation are continuously restructuring the role of donors. The extent to which they have an impact on developing countries will increasingly be shaped by the commercialisation of knowledge to benefit marginalised populations in developing countries. Previously, donor emphasis in addressing the concerns of developing countries has focused on supporting the search for appropriate technology, particularly in health and agriculture. This has mainly taken the form of increased investment in establishing and strengthening public research institutes, which are generally viewed as the main purveyors and developers of knowledge. From one perspective it may be argued that this view is well founded, in that it relates to developing knowledge assets that are recognised as central to development. However, for donor involvement in the strengthening of knowledge assets to have a significant impact on developing countries, donors will have to engage in enhancing knowledge nodes and links that have previously received little attention, including in industry and infrastructure.

Undoubtedly a critical node at stake here is that of design, engineering and associated management capabilities (Bell, 2007; Wamae, 2009). These capabilities are in part responsible for the disarticulation that characterises innovation in developing countries. The role played by donors in the commercialisation of knowledge in developing countries is unlikely to substantially affect innovation dynamism unless it addresses these capabilities, to a large extent within the private sector. More generally, the peculiar nature of technological learning in non-R&D-specific activities requires concerted attention within the broader effort of strengthening the general innovation environment.

Of course, placing the private sector on the donor assistance agenda raises a fundamental question with regard to the general principle of limiting the benefits that may accrue to the donor while maximising those intended for the beneficiary. This may be construed as shifting attention from the public sector, which is thought to be better placed to ensure equitable distribution. The public sector has historically been the main beneficiary

of donor assistance and efforts have been made over time to change the nature of relationships between donors and the public sector. For example, there has been a radical shift from tied aid to more collaborative assistance. In practice, however, it may be argued that other forms of misalignment may have emerged or been reinforced and the principle may not render donor assistance significantly more successful in strengthening the delivery of knowledge assets for socioeconomic benefits in developing countries (Hall and Dijkman, 2008; Clark, 2008). Perhaps it is not too early to make better attempts at integrating market demands into the relationships between donors and developing countries. This may involve some rethinking of the general principle or, to put it more bluntly, of the reciprocal knowledge benefits of donor assistance. Besides, international collaboration on research and innovation between donor countries and developing countries already involves the private sector.

There is some documented evidence of donors' attempts to reconcile the provision of opportunities for knowledge exploitation and commercialisation by the private sector, on the one hand and, on the other, delivery of assistance to developing countries. In the development of the M-PESA service, Hughes and Lonie (2007, p. 65) noted that "[t]here has been much positive discussion in recent years about donor agencies seeking new ways to deliver funds to those who need it most, directly and in a more efficient manner, so that the capital is productively deployed. At the core of these initiatives is a willingness to find more effective ways of delivering assistance." This donor interest increasingly results in funding of the private sector, including from industrialised countries, as in the case of Vodafone. "In 2000, the UK government's DFID [Department for International Development] established the Financial Deepening Challenge Fund (FDCF). The FDCF fund managers and the proposal assessment team were looking for innovation. This could involve the development of a good or service that was not previously available in a target market, a new service that gave customers access to goods or services that would previously have not been available, or the application of a technology that reduced the costs of service provision. Many of the successful applicants were large, well-known private sector companies that faced challenges similar to Vodafone's in pursuing what would perceived as low yield projects. The entrance of a telecom company into a funding competition for the financial services sector took a few of the FDCF proposal review team by surprise, but we overcame some initial cynicism and were awarded funding of nearly £1 million, which was matched by Vodafone." (Hughes and Lonie, 2007, p. 67)

The DFID funding benefited the "unbanked" population which now has access to rapid and secure money transfer services via mobile telephone. It has also benefited Vodafone, not only through the benefits that accrue from the money transfer service to the unbanked. It now also holds a patent that has resulted from focusing on a disruptive market. The extent to which donors will have an impact on developing countries will increasingly be shaped by the commercialisation of knowledge aimed at benefiting marginalised populations in developing countries. Donors are likely to have a much more far-reaching effect on the populations of developing countries if they extend support not only to foreign firms operating in developing countries, but also to developing country firms engaging in innovation activities. Supporting such local firms will involve paying great attention to their design, engineering and management associated capabilities.

With regard to extractive industries, the Ugandan oil sector illustrates various opportunities for donor support in the development of local technological capabilities in this sector. It is noteworthy that although the technological capabilities required in the sector naturally involve R&D-specific skills, non-R&D-specific skills clearly play a critical role in dealing with the various complex issues in the sector. For example, drafting a

suitable policy and negotiating favourable terms with foreign companies can significantly determine the success of creating technological learning opportunities for local firms through innovation-related interactions with foreign firms. This would in the longer term influence the ability of local firms to produce and convert knowledge to value. As pointed out earlier and discussed in the previous chapter, technological learning within enterprises involves deliberate costs by the firm, and policy influences the extent to which entrepreneurs are willing to incur such costs. Donors may, for example, support the extension and deepening of technological learning in extractive industries.

Box 4.1. Ugandan Oil: no local technological capabilities, no oil?

"Petroleum in Uganda is reported to have been discovered in the 1920s, yet oil production is expected to begin next year – close to a century later. Various explanations could be put forward regarding the apparent excessively long duration between when oil was discovered and when its production is expected to commence, including the Second World War down to a civil war that ended in the 1980s. The period that captures attention here is that of the last two decades during which there has been a relatively favourable investment environment in the country."

"The principal prospective area for petroleum exploration in Uganda is the Albertine Graben, which extends into DR Congo; the Ugandan part covers some 23 000 sq. km. To date, only less than half the area has been explored and it is estimated to have about 600 million barrels of resource *i.e.* 100 000 barrels of oil per day for 20 years. The Albertine Graben has been divided into nine exploration blocks, five of which have been licensed to oil companies which include Heritage Oil and Gas Uganda Ltd (UK), Tullow Uganda Operations Ltd (UK), Neptune Uganda Ltd. and Dominion Uganda Ltd."

"Over the last 20 years, the government of Uganda has resolved not to authorise petroleum production until local expertise is developed. Systematic training in various disciplines of petroleum exploration, petroleum economics, petroleum law and petroleum engineering was undertaken during the period. A local team of professionals drafted the policy on oil exploration and has helped the government to sign favourable agreements with the explorations companies."

"The president of Uganda in a visit to Nigeria last year for a learning experience stated that Uganda needed to develop its local manpower in the sector and was particularly interested in training its personnel at Nigeria's Institute of Petroleum. Uganda also has plans to start its own petroleum institute. The government appears to be focused on prioritising the socio-economic benefits of Ugandans, including improved roads and railways, access to clean water, health care and education etc."

"One important observation is the concerted government effort to develop local technical skills for the sector. The President is reported to have said that the country would be ready when there were Ugandans well trained to be part of the exercise. The Ugandan energy minister is quoted to have recently reiterated the government's emphasis on the need to develop local expertise: 'Our objective is to process the oil. We don't want to export it… Our aim is to get an economic return, to get jobs, investment. We don't want anything raw to get out'."

Source: Assimwe, A. (2009), "Oil, Oil, Everywhere!", *New Africa,* March, pp. 42-43.

Watkins, E. (2009), "Uganda Wants All of Its Oil Refined Domestically", *Oil and Gas Journal*, Vol. 107, Issue 11 16 March.

East African Petroleum Conference (2009), "Uganda: History of Petroleum Exploration, Current Status and Future Programs", *www.eapc09.org/eac.php?c=ug*.

The quest for knowledge is likely to lead to stronger knowledge links between the private sector in donor and developing countries. This will continue to raise an array of opportunities and challenges.

A large informal sector and converting knowledge to value

This section describes the informal sector in Africa and discusses the implications for innovation and learning of an innovation systems framework, although the informal sector has so far received limited attention in this framework. A much more detailed analysis of trend dynamics and practices in the informal sector would be required to identify specific opportunities and challenges accurately.

Definition and overall features of the informal sector

In this chapter, the term "informal sector" is used to refer to micro and small enterprises (MSE) whose productive activities are neither illegal nor underground.[6] The chapter adopts the current International Labour Organization (ILO) definition of informal-sector enterprises as those "enterprises owned by individuals or households that are not constituted as separate legal entities independently of their owners, and for which no complete accounts are available that would permit a financial separation of the production activities of the enterprise from the other activities of its owner(s)".

This definition considers an enterprise "informal" when the size of employment is:

> "below a certain threshold to be determined according to national circumstances, and/or [enterprises] are not registered under specific forms of national legislation (such as factories' or commercial acts, tax or social security laws, professional groups' regulatory acts, or similar acts, laws or regulations established by national legislative bodies as distinct from local regulations for issuing trade licenses or business permits), and/or their employees (if any) are not registered" (Hussmanns, 2004, p. 3).

In addition, the term "sector" does not make reference to a branch of economic activity, but "groups together similar kinds of production units, which in terms of their principal functions, behaviour and objectives have certain characteristics in common" (Hussmanns, 2004, pp. 3-4).

The informal economy concept was initially developed in an African context (ILO, 1972).[7] The definition has broadened since in order to reflect the reality of most developing countries.[8] The current definition comprises activities that involve the provision of goods and services in exchange for remuneration, but which are not covered or insufficiently covered by formal arrangements (ILO, 2002a). The informal sector is thus typically characterised by: low entry requirements in terms of capital and professional qualifications; small scale of operations; skills often acquired outside formal education; and labour-intensive methods of production and adapted technology. However, all of these features are not always present. Many informal activities are not small-scale, there are formal skills in the informal sector, and certain informal enterprises are as technologically innovative as many formal-sector enterprises (Trulsson, 1997; Muller, 2005).

The informal economy exists virtually everywhere, including in advanced countries. It is, nevertheless, a dominant feature of low-income countries – where social safety nets and employment opportunities are scarce and wages are low – and it is expected to continue to grow (Ayyagari *et al.*, 2003). According to ILO figures (2002), informal employment accounts for 72% of non-agricultural employment in Sub-Saharan Africa, and for 78% when South Africa is excluded. These figures surpass those of all other developing regions.[9] Employment in the informal sector has been reported to be as high

as 93% in Benin (UNDP, 2007/2008) and 83% in Zambia (Government of Zambia, 2004, quoted in War on Want, 2006). Although average earnings in the informal sector are generally low, the total contribution to GDP is considerable. According to Schneider (2002), the informal sector contributes 42.3% to gross national product (GNP) in Sub-Saharan Africa, ranging from under 30% in South Africa to nearly 60% in Nigeria, Tanzania and Zimbabwe.[10]

Why is the informal sector of particular importance for Sub-Saharan Africa?

With close to 1 billion people, Africa is the second most populated continent after Asia and has the fastest population growth rate at about 2.5% a year. This high growth rate is accompanied by a decline/stagnation of jobs in the formal sector which is likely to drive more people into the informal economy.

The urban population in Sub-Saharan Africa is also growing faster than in any other developing region, at nearly 4% a year. In most large African cities, this translates into increasing segments of the population living in unplanned settlements on the periphery of cities, where the informal sector is the main source of income. This situation is likely to worsen.

The informal sector tends to persist in countries where income and assets are unequally distributed. Rising inequality across most Sub-Saharan African countries suggests that the informal economy is not likely to diminish in the foreseeable future.

There is a strong gender bias against women in the informal economy (Heintz, 2006; UNDP, 2007/2008) – particularly in LDCs[11] – as well as against vulnerable groups such as migrants and children. The sustainable development of African economies requires the protection and empowerment of these marginalised groups and their economic and innovative activities.

Activities in the informal economy are generally not registered or monitored and data are therefore scarce. Very few of these countries have regular systems of data collection in place and where they exist, differences in data sources, collection methods and measurement make comparisons difficult. The scarcity of data is a major concern for low-income countries; there is a strong link between employment in the informal economy and poverty – seasonal and casual workers are particularly susceptible to chronic poverty – and the link is stronger for women than for men (Chen, 2001; Kabeer, 2008).[12] Given the growth and significance of the informal sector in developing countries and particularly in Sub-Saharan Africa, there is an urgent need to study its role in the economy.

How does the informal sector emerge?

The informal sector originates from and is shaped by specific historical socio-economic conditions. Economic reforms, civil war, health pandemics and social exclusion are some of the most common causes, which can be grouped into three categories:

- *Informalisation of formal-sector employees*: A number of studies have looked into the effects of the adoption of structural adjustment programmes across Africa in the 1980s and 1990s. These policies encouraged the reduction of the public sector, privatisation of state-owned enterprises and liberalisation of trade. In many African economies, they led to a sharp decrease in public-sector employment and a search for opportunities in the informal economy. In Kenya for instance, the structural adjustment programme involved retrenchment and early retirement

schemes that offered packages to encourage self-employed entrepreneurial activities in micro and small businesses, generally categorised as informal-sector activities. Similarly, in Zambia, structural adjustment is estimated to have resulted in a decline in the share of formal-sector employment from 17% in 1991 to 10% in 1998. In Ghana the number of civil servants redeployed rose from 15 000 in 1989 to 150 000 in 1994 (War on Want, 2006).

- *Barriers to entry into the formal markets*: These may arise from the social exclusion of a segment of the population (indigenous groups, ethnic minorities/ majorities, religious groups, etc.) or of specific productive activities. In South Africa, for example, the apartheid government specifically banned certain segments of the population from participating in the formal economy. Since the majority of the black population found it difficult to obtain work in the formal sector, they sought alternatives in the informal sector. In contemporary South Africa, the incapacity of the formal economy to absorb informal operators has contributed to the persistence of the informal sector. Informal operators continue to be accounted for as endemic unemployment.

  Other barriers to formal markets take various forms, including excessive costs and regulations for setting up formal businesses as well as corruption around business start-up, granting of business permits and land titles. Such barriers encourage entrepreneurs to remain informal.

- *External forces*: Migration due to social unrest, and natural disasters and the impact of health pandemics such HIV/AIDS also tend to increase the number of participants in the informal economy. For instance, much of the informal sector in Mozambique can be attributed to the Sixteen Years War (1976-92) which drove migration from rural to urban areas. Refugees who relocated to urban areas mainly found their source of income in the informal economy (Xaba *et al.*, 2002). The more vibrant economic centres are also a magnet for immigration, including from neighbouring countries. South Africa has become a destination for refugees from other African countries suffering from civil unrest, as well as for those seeking income opportunities to overcome poverty in their home countries.

The origins may vary but the outcomes tend to be similar across the continent. According to Chen (2001), 93% of new jobs created in Africa during the 1990s were in the informal sector in the wake of economic reforms, globalisation and competitive labour market pressures. Xaba *et al.* (2002) provide some figures for various African countries. For instance, in Tanzania the growth rate of the formal labour force dropped from 3.3% in the 1980s to 2.6% in the 1990s. In Kenya, between 1991 and 1994, the informal sector grew by 16.1%, while employment in the formal sector grew by only 1.6%; by 1995 the informal sector employed 2.2 million and the formal economy 1.6 million. In Cameroon, 80% of all jobs created in 1992 were in the informal economy; in the early 1990s the formal sector in Malawi absorbed only 12% of the total labour force. Clearly, the bulk of new employment in recent years in Sub-Saharan Africa has taken place in the informal economy.

Heterogeneity of the informal sector

The informal economy is far from homogenous. Lack of clarity in discussions of the informal sector can lead to misunderstandings and undue generalisations about fundamentally different activities. Informal activities differ markedly with regard to the nature of and

scope for innovation. For example, the informal activities of street vendors, shoe shiners, junk collectors and domestic servants are different from those of informal transport services, small trading and commercial establishments, or providers of informal computer services. Heterogeneity may also be related to the structure of informal cultures of innovation (based on class, gender, ethnicity, religion etc.).

In view of the diversity of the informal economy, various categorisations have been made (for a summary, see Amin, 2002). This section only gives a few examples. Ranis and Stewart (1999) identified two broad sub-classifications: "traditional" and "modern" informal activities. The former are associated with low capitalisation, low productivity and income, small size and static technology. The latter were characterised by the authors as capital-intensive, dynamic in technology and skilled labour. Charmes (2002) differentiated informal economy activities according to the economic unit: own account operations (with an individual owner operator); family businesses (with an owner operator and, sometimes, unpaid family workers); and micro-enterprises (employer plus some employees). Based on findings from several observers, Haan (2002) classified informal enterprises according to their business orientation, *i.e.* from subsistence-oriented to more entrepreneurial, to income-generating activities, to micro-enterprises and small enterprises.

Such categorisations have fuzzy boundaries, and the categories in which entrepreneurs operate at a given time may overlap. Nevertheless, each of the categories is associated with a technological base and competences. This clearly has different implications in an innovation systems context (see Box 4.2).

Heterogeneity implies different needs, opportunities and constraints as well as differences in the ability to upgrade, adapt, learn and innovate. Haan (2002) summarised some of the differences based on studies in Ghana and Tanzania by Dawson (1993) which indicated the advantages of micro and small enterprises that are relatively more technologically sophisticated and show the ability to:

> "*(i)* upgrade their products and services to a level where they have been able to develop linkages with the new growth sectors of the economy; *(ii)* diversify out of product and service markets where economies of scale attendant on mass production favoured larger-scale competitors; *(iii)* occupy niches better suited to their economies of flexibility and serving an import-substituting function; and *(iv)* prepare themselves against market saturation by raising barriers of entry (in terms of cost of capital equipment and required skills). Conversely, enterprises that experienced little technological enhancement tended to remain largely dependent on low-income groups as their principal source of demand at a time when the purchasing power of these groups has declined, and they are susceptible to overcrowding of the market in which they operate." (Haan, 2002, p. 12)

In sum, informal enterprises differ substantially, in terms not only of their ability to generate income efficiently, but also of their average competences, management practices, capital investment and accumulation of technological capabilities. Moreover, the actors are a heterogeneous group with various reasons for joining the informal economy. These differences need to be acknowledged in order to address efficiently the challenges of innovation in the informal economy.

Box 4.2. Types of informal enterprises

Income-generating activities: This is the predominant type of MSEs, especially in rural areas. They involve a pre-entrepreneurial, subsistence type of self-employment, and function as "the employer of the last resort". Usually they concern part-time, seasonal activities based on traditional technologies, local materials and local markets. Examples include seasonal trading and hawking and many traditional craft activities.

Micro-enterprises: These are slightly bigger than income-generating activities. They involve a few family workers, apprentices and sometimes one or a few (up to ten) permanent workers. They are based on a mix of traditional and more modern but obsolete technologies. They face constraints for access to capital, have modest technical competences and lack managerial skills. They are generally linked to markets through importation of some of their production inputs, and their output targets local or nearby markets. Some have some potential for growth or at least for the development of entrepreneurial skills. Examples include small shops, metal working, carpentry, tailoring and various forms of repair services (*e.g.* radio and TV, cars, household appliances).

Small enterprises: These are firms with roughly 10 to 20 (sometimes 50) workers. They use non-traditional or "modern" technologies in at least some of the production or transformation process. Their products and services range from simple to complex and span a range of consumer types. The marketing pattern may be somewhat complex, involving innovation in raw material procurement and in marketing. These firms are often (on the margin of) the formal sector; they are usually registered with the local government and tend to pay some tax. They are generally based in urban areas. Examples include garment assembly, motorised transport, construction and medium-scale industrial agro-processing.

Source: Adapted from Haan, H.C. (2002), *Training for Work in the Informal Sector: New Evidence from Eastern and Southern Africa*, ILO, Geneva.

The informal sector in the framework of innovation systems

Academic research has focused on innovation as a driving force for development in the formal sector. This is perhaps based on the perception of a strong negative relationship between the size of the informal sector, on the one hand, and the level of economic development and quality of institutions, on the other. Institutional failure is largely viewed as responsible for the persistence of a large informal sector, particularly in Sub-Saharan Africa (Friedman *et al*., 2000).

Innovation is still understood as an activity which occurs within clearly defined sets of rules and norms (institutions) and is undertaken by identifiable actors (organisations) whose interactions (formal or informal) can be monitored, at least insofar as they enhance or impede the learning process that is crucial for stimulating innovation. This excludes the informal sector. Coverage is limited to small, medium or large enterprise operating in a relatively well integrated manner within the formal economy that are able to benefit directly from interactions with other formal organisations and institutions within and outside the economy.

Undertaking research on the informal sector in Sub-Saharan Africa is essential for at least three reasons: *i)* although a large informal sector is an important characteristic of less developed and developing economies, interest in understanding the potential of innovation within the sector remains patchy; *ii)* the informal sector has linkages with the formal economy, particularly through the exchange of goods and services; and *iii)* there are significant structural differences between the formal and informal sectors which affect the nature of their innovative activities. These differences are underpinned by differences

in their various activities. Within the informal sector, these differences are under-researched, and it cannot be assumed that they mirror differences in the formal sector.[13]

The following are some considerations which are relevant to the relation between the informal sector and the innovation systems framework.

Demand-driven innovation

The informal sector responds to the demand for goods and services in both the formal and informal sectors. It has dynamic enterprises that engage in intensive innovation processes in order to satisfy customer demand and expand their markets. Moreover, the opportunistic nature of many informal activities means that they involve "quick responses to market demand and supply" (Bryceson, 2002). In some informal enterprises, the capacity to adapt to new opportunities and new markets may surpass that of the formal economy.

Owing to the fact that the informal sector provides relatively affordable solutions, it is generally assumed that demand in the sector is based solely on the consumer's income level (Ranis and Stewart, 1999). Even so, that demand plays an important role in shaping learning and innovation processes in informal enterprises. For instance a study by Muller in 1978 (quoted in Muller, 2005) indicated that the quality of tools produced by blacksmiths in Tanzania's informal sector surpassed that of large-scale factories. This was attributed to the fact that informal sector blacksmiths (who were often farmers as well) better understood demand preferences in the informal economy and were able to use local knowledge to produce high-quality customer-tailored tools. Additionally, the author argued that customers preferred their products because they were able to adapt them swiftly to sudden changes in farming conditions.

The high rate of entry and exit of informal enterprises[14] reflects rapid changes in demand for products and services in the informal sector. Using data collected in the mid-1990s by Liedholm and Mead (1998), Haan (2002) found that in a sample of African countries, informal enterprises were established at a much faster rate than start-ups in industrialised countries (at an annual rate of 20% in Kenya and 30% in Botswana, compared to a typical 10% rate for formal start-ups in industrialised countries). However, little is known about the forces driving the birth and death of informal enterprises.

Skills in the informal sector

The processes of learning and innovation have several dimensions in the innovation systems literature. Learning is viewed as taking place at the individual level, at the level of the organisation, and at the collective regional and system levels. Learning processes play a fundamental role since they constitute the basis for innovation and accumulation of technological capabilities. Learning involves the generation, absorption and adaptation of both codified and tacit knowledge. Codified knowledge can be acquired through formal education and training, while tacit knowledge is based on experience, and is mostly transferred through employment and labour mobility. Tacit knowledge has been recognised as the basis for a sector's sustained competitive advantage. The high mobility of informal entrepreneurs not only within the informal sector but also to the formal economy, suggests that tacit knowledge is of central importance in the informal sector.

The exclusion of the informal sector from the innovation systems framework implies that the ability to convert knowledge to value through learning and innovation processes is not present in the informal sector. This section argues that the informal sector can

represent both an important source of formal competences and skills for innovation and a large pool of tacit knowledge involving connections between the informal and the formal sectors.

Operators in the informal sector are generally viewed as uneducated. This leads to an assumption that the sector is on the whole technologically backward and incapable of developing technological skills. However, the evidence suggests that there are increasing efforts to improve skills for the informal sector, for example through vocational training programmes (see Box 4.3). Additionally, and as pointed out elsewhere, the informal sector comprises a segment of actors with technical skills obtained through experience in the formal sector and/or in institutions of higher learning. On-the-job training, self-training and traditional apprenticeships are recognised as by far the most important source of skills training in Africa for the informal sector (Liimatainen, 2002; Monk *et al*., 2008). Traditional apprenticeships are individual, self-financing and self-regulating contracts that provide practical training and better prospects for employment after the training. However, skills applied in informal activities are also likely to be acquired in a formal setting (*i.e*. public or private education and training institutions). For instance, informal actors may be transient – operating temporarily in the informal sector – owing to bottlenecks in the formal sector or periods of transition (*e.g*. university graduates who are not immediately absorbed into the formal sector or civil servants made redundant).

Box 4.3. Skills development in the *juakali* sector in Kenya

Juakali is the Swahili term for Kenya's informal economy, and it literally means "hot sun". The informal apprenticeship system, as practised by *juakali* operators in Kenya, has proven to be effective in transferring skills in the informal economy. Although it was originally restricted to artisans, the term has come to include manufacturing, building and construction, distributive trades, transport and communication, and service industries. Currently, most output from the *juakali* sector satisfies demand for food and other basic needs by low- and middle-income rural and urban Kenyans. In 1998, the *juakali* sector was estimated to employ almost 3 million people or 63.5% of the labour force and has expanded since. According to the national economic survey, employment within the sector increased from 4.2 million persons in 2000 to 5.1 million in 2002. In 2008, 79.8% of all jobs in Kenya were in the informal sector with 92.7% of all new jobs created being in the informal sector. The *juakali* sector has received increasing attention from government programmes and international donors.

The sector is labour-intensive and operates in unregulated and competitive markets, where acquiring skills has become a major concern. Informal apprenticeships are the main source of skills provision in the *juakali*, although the government has actively engaged in the supply of skills in the sector. One of the best-known programmes is the voucher programme established as a pilot in 1997 under the auspices of the Micro and Small Enterprise Technology Project. This programme distributed training vouchers to informal operators which they cashed with a personally selected training provider of their choice based on their needs and objectives. Participants only paid 10% of the cost of the voucher while the rest was subsidised by the government. New training programmes were developed tailored to the needs of voucher recipients and offered in off-hours to fit work schedules. There is evidence of the positive impact that training had on those who participated in the voucher programme.

Source: Based on Johanson, R. and A.V. Adams (2004), *Skills Development in Sub-Saharan Africa*, Regional and Sectoral Studies, The World Bank, Washington, DC; Gadzala, A. (2009), "Survival of the fittest? Kenya's jua kali and Chinese businesses", *Journal of Eastern African Studies*, Vol. 3, No. 2, pp. 202-220; Government of Kenya (2009), *Economic Survey 2009*, Government Press, Nairobi.

African governments have started to realise the importance of facilitating skills development in the informal sector.[15] However, many challenges remain as knowledge about the activities and needs of the informal sector is weak. An effective strategy to support skills development in the informal sector would require filling many of the knowledge gaps that remain around the operations of this sector. Looking at the road ahead for the informal sector, King (1996, p. 189) claims: "The challenge, now that so many government policies are finally on paper in favour of small scale and micro-enterprise, is massively to support this quiet revolution that has already begun to happen, and encourage this technological confidence to move up market, to go to scale, even to contemplate what may now seem a pipedream – the implication of new information technologies for the juakali sector in Kenya."

In order to effectively address skills in a context in which the informal sector represents a significant proportion of the labour market, the formal educational and training system needs to be aware of the traditional values, as well as understand the competences that informal operators have, need and utilise (Singh, 2000). As Chapter 7 highlights, policy interventions cannot be decoupled from the socioeconomic and cultural contexts in which they are applied.

Participation in value chains

Effective integration into value chains is considered an important determinant of a firm's innovation and competitiveness. The more complex and innovative the value chain, the more likely it is that firms will undertake innovative activities that target demand (Kaplinsky and Morris, 2001). Informal activities are viewed as taking place outside the value chains in the formal sector. For instance, a traditional medicine practitioner is likely to operate in isolation from the national health-care system and/or global pharmaceutical value chains. Nevertheless, it has been suggested that some informal-sector operators participate not only in formal-sector value chains but also represent a significant share of the workforce in key export industries (Buckley, 1998; Chen *et al.*, 1999; Chen, 2001). This is the case for many home workers involved in the labour-intensive textile, garments and footwear industries, as well as in the production and servicing of simple machines and portable technology[16].

In cases where the informal sector operates in isolation from formal value chains, this can create constraints, for example for access to finance, which is critical for innovation.[17] However, this situation can also trigger innovative solutions, although such innovations are for the most part likely to remain localised and low-scale. Isolated informal sector activities can constitute enclaves in the sector in which they operate and in the economy; the ability to scale up innovations emanating from these may be limited. However, the disconnection of informal-sector activities from formal value chains does not imply that informal entrepreneurs necessarily operate in isolation. Little is known about the informal value chains formed within the informal economy. This is a topic requiring further research.

It is also important to examine the scope and nature of backward and forward linkages between informal-sector actors and formal value chains. Backward linkages show the extent to which informal-sector enterprises obtain inputs from the formal economy in the form of raw materials, technologies, intermediate products or final goods. Forward linkages show the ability of informal enterprises to supply the formal sector with intermediary or final goods, for instance through subcontracting. It has, however, been argued, on the one hand, that subcontracting can be responsible for "abusive" working

conditions in the informal sector (no minimum wage or social security), but also, on the other hand, that it can offer market opportunities to informal micro-enterprises by integrating them into formal-sector value chains (ILO, 2002b).

Another aspect that calls for attention in relation to participation in value chains is the degree to which informal operators have control over the returns to their work, *i.e.* how the value chain is governed or the extent to which different types of value chains provide bargaining power to various actors in the chain. Informal-sector operators are generally thought to have relatively little opportunity for control. A study on South African garbage collectors of recyclable waste (such as paper, glass and metal) found that their dependence on demand for waste products by the formal economy limited their bargaining power (May and Stavrou, 1989).

It is important as well to understand the linkages between the informal sector and value chains in the formal sector and to understand those in informal value chains. This is necessary to ensure that innovation is channelled in ways that improve the livelihood of informal-sector operators and also protect their human rights and ensure decent wages.

The role of intermediary organisations

The role of intermediary organisations in stimulating interactions across the innovation system and fostering innovation capacity is well recognised in the innovation systems literature (*e.g.* Klerkx *et al.*, 2009; Hall, 2005). In the informal sector, because it is considered for the most part as outside of a system largely focused on the formal sector, the scope for upgrading, modifying and improving competences through innovation would appear to rely mostly on individual initiatives by informal-sector entrepreneurs with limited support from the wider institutional framework. However, in recent years, various initiatives have sought to organise workers in the informal economy. In some instances the emergence of business associations that represent and safeguard the interests of the informal sector are making important improvements in the promotion of collective action in terms of market access, information flows, formulation of government policies, etc.

In Sub-Saharan Africa most such organisations operate in a local environment, *i.e.* in a market or street vending area or in a city. However, many organisations have recently expanded their efforts and membership to a national level, often with the assistance of trade unions; examples include the StreetNet Ghana Alliance (SGA), Alliance for Zambia Informal Economy Associations (AZIEA), Zambia National Marketeers' Association (ZANAMA), ASSOTSI in Mozambique and the Malawi Union for the Informal Sector (MUFIS). However, relationships between intermediary organisations of the informal sector and central governments have been reported to be weak (War on Want, 2006).

In some countries, intermediary organisations have demonstrated the ability of the informal sector to provide services that the state has failed to deliver. They play an important role in several ways. First, they facilitate training in product development and business skills and access to knowledge about good practices. Second, they sometimes assist in the development of innovative financial schemes that encourage investments which are often beneficial to the community as a whole. Third, they provide a platform for informal actors to co-ordinate their activities, exchange information and increase their productivity. Finally, they represent the informal sector in its dealings with local governments and constitute the base of political mobilisation in the informal sector. Such associations involve organisational learning and are a critical aspect of innovation.

The role of societal forces and power relations

The innovation systems approach recognises the importance of societal forces in influencing the nature and extent of interactive learning opportunities and innovation. Such opportunities can be stimulated and oriented into specific directions or altogether blocked for political reasons relating to power distribution. Kenyon (2007, p. 11) notes that "In Kenya, for example, the Moi government first encouraged the formation of 'juakali' or informal-sector groups but then backtracked out of fear that they might emerge as a political force that would threaten its position". However, even in the absence of such tensions, other challenges abound. The Kenyan government has over the past two and a half decades designed numerous policies for promoting *juakali* enterprises, but entrepreneurs remain largely unaware of them. Information flows between the formal and informal economy face specific challenges which may relate to cultural perceptions of the informal sector. The informal sector in Kenya is largely viewed as a provider of employment that contributes little to tax revenue. Efforts to support information flows between the formal and informal sector are therefore limited. Other challenges may relate to inappropriate policy requirements for the informal sector owing to poor understanding of its potential to contribute to the economy.

Conclusion

The innovation systems framework offers a platform for analysing innovation processes in Sub-Saharan Africa. It acknowledges the importance of creativity and interaction on innovative activities among many actors. Nevertheless, work is required to adapt the innovation systems framework to the reality of Sub-Saharan African economies, in particular the informal sector. This chapter has identified three major activities that constitute the base of Africa's productive system – extractive industries, infrastructure and the informal sector. Analysis of the systemic nature of these activities through a suitably adapted innovation systems framework would make a useful contribution to understanding learning and innovation processes in Sub-Saharan Africa.

In formal productive activities, there has been a tendency to focus on technological learning and innovation in the manufacturing sector. This sector is generally assumed to offer the most viable channels for making technical knowledge from foreign sources available to the local environment. The concept of development as industrialisation has diverted interest from the extractive industries and infrastructure as important sources of innovation and technological advance. The informal sector has been traditionally excluded from analyses owing to a lack of information. A first step towards creating the ability to convert knowledge to value in Sub-Saharan Africa is to study innovation and learning process in sectors that account for a significant part of these economies. Micro-level evidence can play a critical role in shedding light on these sectors and thus provide a basis for adequate policy for innovation and development. The OECD workshop, Innovating Out of Poverty, emphasised that agriculture needs to be recognised as a knowledge-intensive sector (OECD, 2009).

While there is some evidence of increased commitment to the sectors discussed in this chapter, it remains limited. Innovation processes are complex and may appear to be particularly so in the sectors discussed in this chapter. Nevertheless, a comprehensive rather than a partial analysis of these processes is necessary for further innovation and development in Sub-Saharan Africa economies.

Notes

1. Infrastructure is here defined as consisting of industries such as electricity, gas, telecommunications, water and sewage and transport infrastructure (airports, roads, railways and seaports) (World Bank, 2008).

2. The concept of national innovation systems later led to variants including regional and sectoral innovation systems (see Chapter 3).

3. There is an extensive literature on FDI in developing countries, largely based on standard economic models. This section primarily focuses on literature which takes an innovation systems perspective and looks at Sub-Saharan Africa.

4. The emphasis on inward FDI is not intended to negate the importance of growing outward FDI, particularly from South Africa, in which largely goes to other Sub-Saharan African economies.

5. These shares exclude South Africa which had 2.25% and 0.58% for the corresponding periods.

6. Illegal production can be considered to represent a contravention of the criminal code and underground production can be considered to represent a contravention of the civil code.

7. The term first appeared in a study of Ghana in 1971, but it was only in a report on Kenya (ILO, 1972) that the term was examined. The report identifies the informal sector as such and devotes a chapter to it.

8. Informal economic activities are constantly changing, and the definition of the informal sector has also evolved over time. The definition adopted by ILO in 1993 was broadened following recommendations from the Delhi Group on Informal Sector Statistics, leading to the current ILO definition. However, it is a relatively new concept in official statistics and is still not part of regular data collection in most countries.

9. Estimated at 51% in Latin America and the Caribbean, 65% in Asia and 48% in North Africa (ILO, 2002).

10. Recent data on the informal economy, in terms of both the contribution to the labour force and to national income, are generally updated estimates based on data originally collected in the 1980s and early 1990s.

11. On average female participation in the informal economy is 15% higher than that of men in countries with a low human development index (UNDP, 2007/2008).

12. There are some statistics on this issue in UN Statistical Division (2000). Chen (2001) notes that virtually all of the female non-agricultural labour force is in the informal sector.

13. The heterogeneity of the formal sector is well recognised and has been studied extensively within the framework of sectoral innovation systems.

14. The rate is presumably higher than in the formal economy, given the *ad hoc* nature of many of their activities.

15. For instance in Ghana scholarships are provided for the training of artisans. Moreover, the government articulated its commitment to "facilitate innovation and entrepreneurship within both the formal and informal economy to enhance factor productivity" in its National Medium-Term Private Sector Development Strategy 2004-2008. These efforts have been mainly geared towards formalising businesses, providing access to credit to MSEs and facilitating basic educational courses for the informal sector to make individuals and enterprises aware of the potential benefits of basic disciplines such as bookkeeping, banking and other entrepreneurship skills (War on Want, 2006).

16. In certain countries this type of informal work predominates. For instance in Kenya, *juakali* workers in the textile sector comprises the largest percentage of informal sector workers (Gadzala, 2009).

17. Buckley (1997) adds that the real problems facing micro-entrepreneurs "cannot be tackled solely by capital injections but require fundamental structural changes of the socioeconomic conditions that define the informal sector activity" (p. 1081). Rogerson (2001) emphasises the importance of market demand (low purchasing power), market access, lack of diversification, inadequate infrastructure, and poor access to raw materials as critical points for MSE intervention, stressing the importance of moving non-financial support services to the African policy agenda.

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