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TECHNOLOGY AND INNOVATION REPORT 2015

*Fostering Innovation Policies
for Industrial Development*

OVERVIEW





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PREFACE

Building productive capacities and promoting sustainable industrialization have an important role to play across the spectrum of the integrated 2030 Agenda for Sustainable Development. The Agenda recognizes that the notion of sustainable industrialization is multi-faceted: it is not solely limited to environmental sustainability, but refers to efforts that are technology-led, productivity enhancing and poverty-reducing. It is based on the understanding that no industrial policy is complete without an accompanying innovation policy. Both are essential and complementary to shaping developmental outcomes and creating prosperity for all.

The UNCTAD Technology and Innovation Report of 2015 addresses this urgent policy priority by analyzing the crucial role of technological learning and innovation capacity. Promoting industrialization is a challenge throughout the world. This report helps to address some of the questions that policymakers face when seeking to forge new paths to secure a prosperous future for their people.

I encourage governments, policymakers and development partners to use this report as a resource as they seek to formulate the most effective approaches to achieving the Sustainable Development Goals.

A handwritten signature in black ink, reading "Ki Moon Ban". The signature is fluid and cursive, with a long vertical stroke extending downwards from the end of the name.

BAN Ki-moon
Secretary General
United Nations

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OVERVIEW

I. INNOVATION AND INDUSTRIAL POLICIES HAVE BOTH REGAINED IMPORTANCE

Industrialization is by no means an easy process. This report is set against the broader international context, wherein a large number of countries have placed renewed emphasis on policy frameworks on industrial policies and science, technology and innovation (STI or innovation policies) to address the challenge of fostering industrialization and closing the technology gap. This report analyses an issue that is of high policy relevance, namely: how can synergies between industrial and innovation policy frameworks be harnessed to help countries to leverage overall growth and transformation.

In the quest to promote a 'great transformation' of sectors and the economy, industrial development and STI policies overlap on the question of promoting technological learning and competence building. These overlaps assume added importance for developing countries as they often lead to a parallel narrative on technological learning. In practice, this implies that the incentives and instruments of both policies are often quite similar; furthermore, they tend to lead to duplication of scarce resource, inter-agency rivalries and less than satisfactory outcomes when they are not accompanied by well-coordinated policy processes.

A second reason why the overlap matters is that both policies approach technological learning from different perspectives. For example, while industrial development strategies set overall economic targets, innovation policies provide the institutional infrastructure for learning, as well as individual targets and supportive incentives to firms. While industrial development strategies aim to develop high-technology sectors, stimulate job growth and eradicate poverty, priority sectors and the *modus operandi* for such prioritization is usually set out in STI frameworks. Similarly, the industrial development strategy of a country may emphasize job growth, particularly to facilitate recovery from the economic and financial crisis of 2007-2008, but it is the STI framework that determines how this job growth can be based on technological development, and how high-quality and sustainable jobs can be created. Despite these overlaps and the complementary nature of both policy frameworks, neither of them is redundant, and close coordination is crucial to enforce developmental outcomes.

While there are some good examples of countries within the developing world that have historically coordinated their industrial development strategies with STI policy objectives, there have also been an equal number of countries that have not managed to do so. Friction has long existed between the two sets of policies due to the fact that consolidation of existing industry (which in many countries is still traditional, or predominantly composed of SMEs), or the promotion of innovation and industrial development are seen as two separate issues.

II. COORDINATING THEIR IMPACT IS ESSENTIAL FOR DEVELOPMENTAL OUTCOMES

Industrial development and innovation are not either/or options. Industrial upgrading, whether in traditional or new sectors, cannot be achieved without promoting technological upgrading and innovation capacity. The inability to acknowledge and foster this relationship has been the undoing of several developing countries, and has resulted in local industries being unable to enhance productivity despite repeated industrial policy efforts, mainly because there was no emphasis on technological change at the firm level.

Coordinated frameworks on industrial development and technology and innovation capacity need to be emphasized by all countries; a good start in this regard is to understand the links that exist between the two policies and how they impact key actors in the industrialization process, namely, the state, the market, the private and public sectors and domestic and foreign actors. The experiences of East Asian countries and other emerging economies illustrates that getting the right mix of interventions to foster the interaction between these actors is critical for successful industrialization. Crucial questions need to be reframed, and choices refined. For example, it is not whether to foster public research or not, but rather how much public research is needed to boost the local private sector. Similarly, the concern is not whether there should be foreign direct investment (FDI) or not, but rather what is the right kind of FDI, and how can it enhance technology absorption capacity.

Finding the appropriate balance and the ‘right’ combination of incentives is contingent on how the two policies interact, not just at the policy definition level, where policy goals and targets are set, but also on the mix of incentives contained in these policies, as appropriate to the local context. This rests on how the policies are coordinated, and more specifically with a focus on *getting the policy processes right*. An innovation and industry-friendly climate is therefore not about just specifying/ granting a broad range of incentives, but has rather more

to do with identifying the activities, the beneficiaries that need support (i.e. the kind of firms and what they should be focusing on), and how such support can be coordinated through existing agencies. Goal 9 of the 2030 Agenda for Sustainable Development embodies this imperative for coordinating industrial development with fostering innovation. Making strides towards industrial development in years to come will hinge upon identifying and promoting these linkages between innovation and industrial policies from a practical perspective, to avoid pitfalls and channel opportunities for local economies.

In practice, therefore, a synergistic environment for innovation-led industrial development rests on coordination of policy implementation at the macro-, meso- and micro-levels. At the macro-level (i.e. at the level of national oversight and policymaking), policy frameworks on both industrial development and STI policy should be articulated to provide a lean and cogent conceptualization of common goals and objectives. The coordinated implementation of these policy frameworks occurs at meso-levels, i.e. when the policies are translated into implementation through incentives, programmes and agency mandates. The impact of these policies on firm-level performance occurs at the grassroots level, and is hence a micro-issue, which is affected by a range of factors that impact day-to-day performance. Without coordination at all three levels, it would negatively impact firm-level performance and vitiate the common goal of promoting technology-led industrial growth, even if countries have relevant policy frameworks on industrial development and innovation in place.

In ensuring that the policy regimes are well coordinated at the level of conceptualization, implementation and practice, the following questions are of relevance:

- (i) How does innovation policy fit into the broader context of industrial development strategies of countries in practice?
 - (ii) What are the most critical areas of coordination?
 - (iii) What lessons can be drawn from the experiences of countries in promoting policy coordination at the macro-, meso- and micro-levels for improved firm-level performance, and can they be understood and applied to other countries?
-

III. FIVE PRINCIPLES CAN GUIDE THE WAY

This report identifies five broad alignment issues that play a causative role in the overlaps, namely:

- (i) The existing gaps in policy articulation and design;
- (ii) A lack of policy coherence and policy competence in the implementation process;
- (iii) The prevalence of competition between ministries, agencies and duplication of efforts, which result in resource constraints;
- (iv) Insufficient capacity to conduct policy evaluation and monitoring; and
- (v) A lack of coordination between policymaking, governmental interventions and business environment.

It proposes five principles as guidelines to countries to find the right balance between policy processes and policy coordination. These principles are aimed at:

- (i) Identifying and eliminating policy redundancies in the policy conceptualization and policymaking structure;
- (ii) Promoting policy coherence and policy competence;
- (iii) Using resources carefully;
- (iv) Developing capacity for proper policy evaluation and monitoring; and
- (v) Coordinating the policymaking processes closely vis-à-vis their impact on the business and enterprise environment, and promoting private sector engagement.

IV. COUNTRY FINDINGS REINFORCE THE IMPORTANCE OF GETTING THE POLICY INTERFACE RIGHT

In the three African countries that are the focus of this report, industrial and STI policy issues were examined against the following questions:

- (i) What are the historical, economic and systemic factors that contribute to the way STI and industrial development policies evolve in countries over time (policy conceptualization and policy history)?
 - (ii) How do these historical, economic and systemic factors impact on the way policies and institutional support are structured in practice (policy coordination and implementation)?
 - (iii) How does this impact firm-level performance in countries (policy impact on firms and sectors)?
-

The country studies are detailed investigations that show how the institutionalized patterns of policy conceptualization and policy implementation (in terms of coordinating the various components of industrial development, and aligning the instruments and mechanisms to local requirements) are critical to ensure firm-level performance.

1. Factors for country selection

The country selection was based on three sets of parameters:

- (i) The developmental and institutional circumstance represented by the country: While Nigeria is a commodity-rich developing country; Ethiopia is a least developed country (LDC) with a resource-concentration in agriculture. This is juxtaposed with the experience of the United Republic of Tanzania, which is a mix of resource-based activities and other sectors. As a result, each of these countries serves to illustrate a developmental challenge in the realm of coordination of industrial and innovation policies for developmental outcomes.
- (ii) The ongoing policy transformation in industrial and innovation policies: All the three countries discussed in this report have national vision documents, new industrial development strategies and STI policies that embody the aspiration of its leaders and policymakers to transform their nation into 'middle-income' economies within the next two to three decades.
- (iii) Difficulties faced in channeling R&D expenditure and GDP growth rates towards technological learning: All three countries have experienced relatively impressive GDP growth rates over the past decade if not longer, and increased R&D expenditure as a percentage of GDP in the 2000s. Despite this, they have faced difficulties in focusing these investments into greater technological learning, particularly at the firm level, as demonstrated by the lack of greater exports of medium and higher technology products.

2. A summary of country findings: Nigeria

Nigeria aspires to have a mature economy with a diversified industrial base, and to reduce reliance on oil-based exports, which currently account for over 90 per cent of its export earnings. Industry, the second largest sector in Nigeria, accounted for about 26 per cent of GDP in 2013, but most of this was attributable to the oil sector: out of \$100 billion worth of merchandise goods exports in 2013, fuels accounted for \$94 billion. The reliance of the economy on crude oil exports, which accounted for about 70 per cent of total exports during the past four decades,

led to a shift away from industrial activities of a productive nature, leading to low structural change, low dynamism and over-dependence on a single commodity. Key general, sectoral and firm-level findings based on the empirical survey of 200 firms across three sectors (agro-processing, ICTs and health and pharmaceuticals), field interviews and a historical review of the country's economic development are summarized below.

**a. Tracing policy conceptualization and policy history
from 1960s until the present day**

An in-depth policy analysis shows that the failings of development plans since the 1960s inhibited the adoption of a comprehensive approach integrating technology acquisition and training to industry. As a result of this, flailing industrial productivity led to the gradual ineffectiveness of a large number of public sector enterprises and local firms. The S&T policy adopted in 1986 and which was revised in 1997 and 2003 did not succeed in reversing the shortcomings of the national innovation system because technology was largely conceived in terms of generic acquisition of hardware machinery and equipment, rather than as a process of building technological absorption capacity. To address this, Nigeria enacted the National Industrial Policy of 1998 and simultaneously embarked upon a system-wide review of its S&T framework in 2005 to shift the focus to building innovation capacity. As a result of the review process, a new STI policy framework was launched in 2011 to harness, develop and utilize STI to build a large, strong, diversified, sustainable and competitive economy that guarantees a high standard of living and quality of life to its citizens.

Along with the 1998 National Industrial Policy, Nigeria is also guided by the *Nigeria Vision 2020*, which is currently being implemented through the National Implementation Plans. *Nigeria Vision 2020* is a long-term strategy aimed at transforming the Nigerian economy into one of the top 20 economies by expanding the country's economy from \$173 billion in 2009 to \$900 billion by 2020 with a per capita income of \$4,000. The review finds that past efforts in promoting industrial development in Nigeria failed largely due to a lack of focus on technological learning at the plant, sectoral and industry level. Current policy efforts seek to address this and integrate these concerns, which is a very positive development.

b. Assessing challenges for policy coordination and implementation

However, despite the recognition that industrial policy and STI policy are complementary, survey results from the three sectors show that firms continue to encounter difficulties that affect their ability to perform; these ongoing difficulties stem from policy coordination and implementation issues.

This can be attributed to two issues. Both the new STI policy and the Nigerian industrial development strategy and implementation plans are largely being implemented within an institutional setting in which industrial development and innovation capacity are considered as two contrasting goals. Furthermore, several older policy directives aimed at changing underlying policy processes to promote collaboration and communication among the various actors in the institutional support system have yet to be considered. For example, there is an indication in the new STI policy that the National Science and Technology Act, CAP 276 of 1977 and the Federal Ministry of Science and Technology Act No 1, 1980 would be reviewed, but this review had not been carried out at the time of the survey. The mandate of the National Office for Technology Acquisition and Promotion, which was created in 1979, also needs to be reviewed and given a mandate to ensure better coordination and impact.

A second issue is that both policy frameworks, despite their aims, have not yet addressed basic issues of capacity building and infrastructure. That is, they still remain largely concerned with articulating objectives rather than addressing grass roots challenges. A lack of investment into public utility services continues to hinder the provision of good physical infrastructure for industrial activities. Particularly, the lack of electricity and transport infrastructure has been a hindrance to industrial production since the 1970s, when the issue of power supply was not well-integrated into the construction of large-scale industrial plants.

c. Measuring policy impact at the firm level

The survey results show that despite the efforts to enact the two policy frameworks, there is not much real impact up until now on the way firms innovate, learn and compete. The focus of their activities is in marketing and distribution of products rather than innovative activities that can help create new products and processes. The survey also shows that Nigerian firms are engaged in incremental learning activities, and often ranked their products and processes as new to the local market, and not to the region or the world.

Many of the firms interviewed were often unaware of the national STI policy, or the incentives contained therein. Companies were also unaware of new agencies that were recently set up to assist them to compete, such as the National Competitiveness Council. The survey also showed that there was a low awareness of the kinds of incentives that were available to promote firm-level innovation, learning and competitiveness. Firms also reported difficulties in benefitting from these schemes, where available, due to the extensive bureaucratic processes involved.

3. A summary of country Findings: United Republic of Tanzania

The United Republic of Tanzania has recently emerged as one of the best performing economies in Africa. This is in marked contrast to the 1970s when the real per capita GDP growth rate was only 0.5 per cent and which further plummeted into negative growth rates (-0.7 per cent) in the 1980s. However, in the past two decades, the country's economy experienced a steady rise with real per capita GDP growth rates, which surged from 0.9 per cent in the 1990s to 4 per cent in 2000s and 4.1 percent in 2010-2014.

Despite these trends in overall growth pattern, industry has contributed the least to GDP growth, lagging behind services and agriculture since the 1980s. By way of contrast, the services sector accounted for the largest share of GDP in 2013, with a contribution of 47.3 per cent; the agriculture and industry sectors accounted for 31.7 and 21 per cent of GDP, respectively. The challenge therefore remains one of fostering industrialization through technological change and innovation. Relevant findings are summarized below based on a three sector survey (agro-processing, ICTs and health care and pharmaceuticals) of 144 firms, and analysis of the policy regimes on industrial policy and STI since the 1960s.

a. Tracing policy conceptualization and policy history from 1960s until the present day

The 1967 Arusha Declaration served as a beacon of policy focus in the immediate post-independence period, with implications for early industrial development policies focusing primarily on state-led industrialization through local, indigenous efforts. However, by the end of the 1970s, failures to boost industrial capacity were attributed to a low focus on technological capacity. This not only led to the establishment of the Tanzania Commission for Science and Technology in 1986, but also the national S&T policy that was formulated in 1996.

However, the 1996 S&T policy suffered from certain shortcomings, the most important of which was insufficient focus on technological learning and innovation.

Sectoral objectives and strategies were also not fully translated into policy actions and investments in knowledge infrastructure were not realized as intended. This led to a continued disconnect between industrial and innovation policy frameworks in the country.

Additionally, since the 1980s, the United Republic of Tanzania also underwent a few re-orientations of its industrial policy. The earlier import substitution policies were replaced with a market-oriented approach in the late 1980s, along with trade liberalization of the economy. Trade liberalization resulted in a large-scale exit of local firms from the Tanzanian market due to a lack of institutional support for industry and their inability to compete with foreign firms. In an effort to revive the local industrial sector, the government sought to promote an industrial strategy focusing on high-technology sectors, as in the East Asian economies. Lacking donor-support, this plan was replaced with a National Strategy for Growth and Poverty Reduction (NSGRP 2005-2010), which focused primarily on poverty reduction. An integrated industrial development strategy was also enacted since 2011, along with the National Development Vision 2025. Currently, the United Republic of Tanzania is in the process of implementing its second five-year plan to further these objectives.

In order to achieve the targets set out in the industrial development strategy, a revised national STI framework was tabled in 2013, and is pending approval of the Cabinet.

b. Assessing policy coordination and implementation

Despite recent efforts to consolidate industrial performance, there is a lot of policy incoherence in the design and articulation of policies on the one hand, as well as the implementation of policy mandates on the other. A lack of connectedness among the industrial development plans, sectoral strategies and the national S&T policy, coupled with the absence of a plan to guide the coordination of these policies, continue to hinder the country's development. There seems to be an urgent need to implement the new STI Act, and also to coordinate industrial development with technological change and technology transfer. This is currently being considered a priority by the national planning commission for the second five-year plan (set to be enacted sometime in 2016).

The survey and interviews showed that the coordination shortcoming related to the roll-out of these plans, strategies and policies are in large part similar to what was observed in the 1990s between the S&T policy, industrial policy, finance, education, etc. As a result, although the policy imperative is to boost local production capacity

or expand the industrial base, this is compromised by a lack of institutional coordination. Meanwhile, despite the new integrated industrial development policy of 2011, a shortage of emphasis on technological learning, low absorptive capacity and low emphasis on innovation continue to hinder industrial development, particularly in the manufacturing sector.

These shortcomings have, to a large extent, negatively impacted industry. At the sectoral level, manufacturing activities went into a steady decline since the 1990s and accounted for 7.2 per cent of GDP in 2013, with the bulk of industrial growth being accounted for by non-manufacturing sectors, such as mining and construction. The manufacturing sector was characterized by the creation of low-value added products for the domestic market and export-oriented activities with little or no productivity growth.

c. Measuring policy impact at the firm level

Over 88 per cent of industry is comprised of micro-enterprises with less than five workers, which contributed a third of the country's GDP. Overall, most of the industry is made up of informal, micro- and small-sized firms, with a few medium and large-sized companies. Further, the majority of the micro- and small-sized medium firms operate in the services sector, while the rest are in agriculture and manufacturing.

The survey found that at the firm level, few businesses were engaged in innovation activities. Most of the small-scale firms were engaged in in-house operations relying on local and often self-sourced financing. Lack of finance, in particular, has prevented firms from undertaking technological development and innovation. Also, firms focus on short-term activities on how to survive and sell their products because of the uncertain innovation and industrial environment in which they operate and lack of support impedes their ability to innovate.

Survey data showed that a lack of policy coherence on various aspects of industrial and STI policies, such as levies imposed on imports of raw materials (as opposed to an exemption of levies on final products) in some sectors served as a disincentive to innovate or manufacture locally.

In addition, firms reported receiving little in the way of government support to participate in innovation and finance schemes. Firms also found that regulatory frameworks were often very hard to navigate, and that this contributed to a large informal sector characterized by low technological capability and lack of investment in R&D. Finally, shortcomings in the innovation environment affected firms to a

large extent. Currently, firms have little or no interactions with universities, public and private research institutes and other intermediate organizations. This hinders technological learning in both the public and in the private sector.

4. A summary of country findings: Ethiopia

Ethiopia has recorded impressive economic growth over the past two and half decades. The real per capita GDP growth rate rose from -1.4 per cent in the 1980s to 2.3 per cent in the 1990s, peaking at 6.7 per cent between 2010 and 2014. Ethiopia's current challenge remains one of diversifying its economic base, and strengthening its economic performance. The bulk of the Ethiopia's GDP value added has come from the primary sector comprising agriculture, hunting, forestry and fishing, which jointly accounted for 45.5 per cent of the GDP value added in 2013. At the sectoral level, the key challenge is one of increasing the share of GDP value added from industry, which has not only been less than agriculture and services over time but its share of contribution has also declined in the past four decades from 16.2 per cent in 1973 to 11.1 per cent in 2013.

General findings, as well as sectoral and firm-level findings, are summarized below based on a survey of two sectors (agro-processing and pharmaceuticals) and a historical review of the industrial and innovation policy frameworks.

a. Tracing policy conceptualization and policy history from 1960s until the present day

Detailed policy analysis shows that Ethiopia's recent economic success has been shaped by the country's developmental plans over the past two decades, the most relevant of which is the Growth and Transformation Plan (GTP). This five-year economic master plan was launched in 2010 and aimed at achieving 11-15 per cent annual GDP growth and large-scale investments in industrial and agricultural sectors by 2015. A second phase of the GTP, the GTP II, is due to be launched in 2016 to cement and build on current achievements.

Along with the GTP 2010-2015, Ethiopia also sought to revive and resuscitate Ethiopia's S&T policy framework. The STI framework was fragmented since its creation, which despite the formulation of the first national S&T policy of 1993, and the re-establishment in 1994 of the Ethiopian Science and Technology Commission as an autonomous public institution was not entirely addressed. A fundamental weakness of the 1993 S&T policy (which was later amended in 2006 and 2010) was that it was narrowly focused on S&T without any emphasis on innovation capacity.

Furthermore, the policy envisaged no coordination with industrial development at the sectoral and plant levels. A revised policy of 2012 now seeks to focus attention on innovation and technology transfer, in conjunction with the creation of a centralized innovation fund for R&D activities, which was established with the aim of committing at least 1.5 per cent of the GDP annually to applied research.

The GTP 2010-2015 and the STI policy are well coordinated in their goals, and the GTP reinforces the issue of building capacity in the local context by placing emphasis on the development of universities, research institutes, technical and vocational education and training institutions. Programmes have been defined that promote these linkages namely: (a) the development of industrial zones; (b) capacity building programmes; (c) university-industry linkages; and (d) the creation of a centralized R&D and innovation fund.

b. Assessing policy coordination and implementation

The share of investment in manufacturing activities has been impressive, wherein Ethiopia approved 1,211 projects for the manufacturing sector in 2011/12, which accounted for 31 per cent of the share of total investment capital over this period. The central challenge now is to ensure policy coherence and coordination between industrial and innovation policies at the implementation level, which still remains weak. Particularly, there needs to be a greater emphasis on the provision of a common STI infrastructure, technology-transfer venues and information sharing of relevance to promote the industry, especially to engage in high technological intensity activities.

Policy coordination and implementation is still less than satisfactory because the institutional apparatus in the country remains weak and fragmented in this regard. The survey and analysis found that a large number of intermediary agencies such as those that can help industry acquire and upgrade technologically are missing, or just being set up. A good case is that of the Food and Beverages and Pharmaceuticals Industry Development Institute, which has recently been set up to promote such linkages recently.

c. Measuring policy impact at the firm level

The limitations of policy coordination and implementation are felt at the firm level, as the survey findings show. The results show that at the firm level, there is a lot of capacity in Ethiopia's agro-processing activities beyond coffee production, e.g. several firms are engaged in leather activities, but these activities are dominated

by SMEs. The survey also found that firms face significant difficulties in diversifying into technology-intensive activities, especially those that can contribute to value-additions.

The difficulties faced by firms are partly due to a lack of adequate institutional support to develop technology and innovation capacity as a whole. As a result, most companies (even those in the agro-processing sector) continue to focus on domestic market opportunities, and only a few have ventured into markets beyond Ethiopia. The survey also found that firms rely heavily on not so up-to-date equipment and machinery, but some are acquiring new knowledge through the acquisition of new machinery and equipment, even though the lack of technological absorptive capacity hinders their ability to innovate. Promoting technology transfer, access to finance, joint ventures for production and value-addition remain really important to firms.

V. WHAT MATTERS IN PRACTICE: FINDINGS AND RECOMMENDATIONS

The difficulties in coordinating policy objectives, implementation and impact, as faced by the three countries in the report, are not isolated issues. A large number of countries in the developing world are faced by the same kinds of issues. Some general findings stand out in this regard. Firstly, although there have been laudable efforts in defining policies, simple infrastructure issues that have impeded industrial development over a period of decades have not been resolved. This should be the first area of focus. Secondly, countries continue to face difficulties in coordinating implementation – a development that can be traced back to the lack of policy coherence. This is not to say that ministries and agencies have not been well intentioned. In fact, the survey found that despite their best intentions and efforts, firms were not benefiting from these efforts due to a lack of policy coordination. This reinforces the need to get the policy processes right. Other more specific results on the interface of industrial-innovation policy are presented below, with accompanying recommendations.

1. There are several gaps in the policymaking structure

In all three countries, as is the case with a large number of other African countries that are also reviewed in the report, national STI policies either evolved much later (at least two decades after the industrial development policies were enacted), or evolved in parallel with little or no coordination with established industrial development frameworks.

The report finds that within countries, a predominant issue is where industrial policy is placed, and how it is articulated. In the case of a large number of developing countries, policies for industrial development are not usually articulated as industrial policies, but rather as industrial development strategies, or as national visions, or as part of recurring national developmental plans aimed at facilitating overall development and economic transition.

If countries enact national visions that include industrial policy objectives (which is the case not only in Ethiopia, Nigeria and the United Republic of Tanzania, but also true for a large number of other African countries), it needs to be borne in mind that such national vision statements generally have a broader scope than just promoting industry, and often tackle issues of poverty, youth, environment, employment and urbanization. In several countries, industrial development objectives are embedded in their national development plans, and are often recurrent on a term-by-term basis.

Therefore, although such visions or strategies encapsulate the main industrial objectives or goals, there is a need to have clear roadmaps to achieve these visions, with accompanying targets, so that these can be linked to a policy implementation mechanism on the one hand, and to STI and other policies (covering areas such as trade, investment, and development) on the other.

Another reason for the gaps in policymaking is that a large number of industrial development strategies are one-dimensional: they target overall industrial development and an increase in per capita GDP growth rates, or a rise of specific sectors. The focus should instead be on closing the productivity gap, i.e. how to ensure greater returns from productive activities. This leads to gaps in policymaking, including a neglect of:

- Technological and technical support systems required for the growth of sectors;
 - Links between the human skills requirements of the various sectors with enhanced performance projections;
 - A clear articulation of how the higher GDP spending on R&D will form part of public sector assistance to technological upgrading, e.g. the establishment of common industry services, technological incubation, industrial research labs, etc.
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2. Policies suffer from inconsistencies and often, overall incoherence

A key issue that stands out is that sophisticated policies are not sufficient. While industrial development strategies in the selected countries recognize the importance of technology-led growth, and whereas all STI frameworks recognize the importance of coordinating with industrial policy, the same historical patterns of lack of coordination between innovation and industrial policy frameworks persist. Countries have tried to tackle these issues by providing for common goals or missions in the two policy frameworks, but policy incoherence often occurs at the stage of policy articulation, and is also often deeply rooted in policy implementation processes.

The country chapters help to illustrate the main finding of the analytical framework, namely that it is crucial that policy *processes* are clearly laid out. Specifically, the findings show that even elaborate policy frameworks on STI policy and industrial development need to be accompanied by policy consistency and coherence at the levels of:

- (a) Policy conceptualization and design;
- (b) Policy implementation and coordination

A number of reasons explain the existence of policy incoherence and inconsistencies. The country chapters show that they could be the result of ineffective policy transitions (where countries embark on changes in policy, but remain incomplete and lose momentum as a result of changing political leadership at different levels of governance), institutional inertia and resistance, or a lack of policy competence to foresee and avoid overlaps. A second form of policy incoherence is when the frameworks are overarching but not accompanied by a concrete implementation plan. However, in many other cases, policy frameworks are accompanied by implementation mechanisms, but several shortcomings have prevented them (to a different extent in the three countries) from achieving an impact. A key issue (already raised in the previous point) is that in the absence of stocktaking and attempts to streamline the institutional apparatus, many public sector agencies have mandates to implement the policies. When the policy framework is not completely consistent or accompanied by clear implementation mechanisms, the country analyses show that there is no clarity at the policy implementation stage as to which of the existing agencies should implement the mandates contained in the policy framework and how they should be implemented.

a. Policy incoherence in conceptualization can be a result of ineffective or slow policy transitions

Moving towards an innovation policy is a challenging coordination task, and not just one of providing a regulatory framework. In reality, although a wide variety of policies emphasize ‘innovation’, field investigations show that while some policies seek to fundamentally chart new ground, in some other instances, the policies often make reference to ‘innovation’ but are not comprehensive enough to tackle the difficulties of fostering innovation. Furthermore, there are difficulties imposed by the fact that policy processes are not followed through, and maintained during and after political transitions in countries.

The same difficulty holds true for industrial development policies. Sudden policy shifts that do not promote a coherent notion of industrialization as a continuous process lead to policy inconsistency and incoherence simply because they do not offer a consistent and reliable level of support to the process of industry transformation.

b. Policy incoherence can be due to institutional resistance and inertia

The field interviews and surveys shed light on the fact that policy and institutional history matters. Historical analyses of the evolution of policies and implementation mechanisms conducted in the chapters shows that agencies implementing these mandates operate within weak, unaccountable implementation processes. Such inter-agency rivalries exacerbate policy coordination issues and have led to a large-scale neglect of the private sector. In almost all countries surveyed, private sector enterprises considered that existing policy frameworks and the actions of implementing agencies operated at a distance from them, making little attempt to liaise and understand the constraints they faced or tried to alleviate them. Such institutionally embedded habits and practices often offer severe resistance to newer more collaborative modes of interaction. Policies on industrial development, if they are to be coherent with innovation policies, should seek to address the operative mandates of agencies to promote a change in mindset.

c. Policy incoherence can be due to insufficient policy competence / policy foresight

Another set of coordination issues arise from the fact that both industrial development and innovation policies often identified targets and objectives that were impacted upon

by other policies differently. For example, in Ethiopia, the STI policy aims to ‘develop, promote and commercialize useful indigenous knowledge and technologies’. To promote this, there would normally be a need to assess whether the *sui generis* system created by the Ethiopian 2006 Proclamation on Access to Genetic Resources and Community Knowledge, and Community Rights could help protect useful indigenous knowledge and technologies. In other words, the IPR protection has to be integral part of the indigenous knowledge commercialization process. But what appears to be missing in the objectives are strategies to create STI policy awareness at all levels of government, including the Cabinet and Parliament, as well as to build an innovation culture among businesses, the youth and society at large. Similarly, one of the projects under the GTP is the establishment of industrial parks, but these are expected to act as hubs for FDI, and to leverage technology transfer of the kind outlined in the country’s STI policy. This once again calls for coordination of policy implementation on a strategic basis between the ministries, as well as agencies implementing the mandates on industrial development, investment and STI. But often the lack of policy competence, as well as a lack of incentives on part of the agency employees leads to very minimalistic interpretations of these mandates.

d. Recommendations to improve policy coherence in conceptualization and design

Assessing the successes and difficulties faced by the countries in this report, the following recommendations are suggested to avoid this kind of policy incoherence:

- Policy vision, mission and objectives should be closely aligned: The review of ongoing initiatives at the African level, as well as the country chapters lend strength to the conclusion that a close alignment of industrial development and innovation policies is still an elusive goal in countries. Oftentimes, even the targets or objectives for STI mentioned in industrial policy are not the same as the objectives of the STI policy itself (see previous point), thereby promoting policy incoherence and leading to confusion.
 - Emphasis should be placed on developing local linkages and unlocking learning potential: Although STI policies clearly lay down the broader vision to build capacity, fostering an innovation ecosystem calls for emphasis on the creation of an innovation and entrepreneurship culture with concrete links to industrial development. It is necessary to promote entrepreneurial programmes, align academic curriculum with entrepreneurial needs, and introduce entrepreneurship classes at schools and institutions of higher
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learning to enable the effective application of new technologies and innovation for industrial development. The GTP in Ethiopia, for instance, has at least two such projects on building capacity.

- While enacting new policies, there is a need to clearly link them with existing initiatives and agency mandates: The country chapters found that although national policymakers are aware of the need to review existing policies and agency mandates, change is usually slow, leading to policy ineffectiveness, as in the case of Nigeria. Making this happen alongside the policymaking/revision process is critical for at least for two reasons: Firstly, previous policies often have agency mandates that call for review in the light of the new policy, to ensure that the institutional framework embodies the changes in a dynamic and efficient way. Secondly, reviewing policy mandates is very important to ensure that national resources, particularly financial resources and human skills, are used efficiently.

e. Recommendations to improve policy coherence in in the implementation process

The recommendations in this regard include:

- Coordination hurdles need to be tackled at the level of agencies and organizational structures in order to avoid overlapping mandates between newly created agencies and existing agencies, and how they interact with the private sector. Duplicated measures should be taken stock of, and efforts should be made to eliminate such duplication over time.
 - Policy changes should be accompanied by appropriately funded and transparent budgets and staffing of skilled employees to facilitate their implementation.
 - Schedules and critical milestones to be achieved jointly by the STI and industrial policies should be clearly defined ahead of the process, and also framed in a manner that addresses national needs and industry characteristics.
 - A high-level governance structure and coordination matters, especially at the ministerial level. More efforts should be made to ensure such interaction.
 - Best practices from other countries can only serve as a guideline; the right combination of innovation and industrial policies is a personal choice of countries.
 - The focus should be on contextualization in order to achieve results.
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3. Policy monitoring and evaluation mechanisms are required to ensure efficient use of existing resources

Monitoring and evaluation (M&E) mechanisms are relevant from a variety of perspectives. They not only enhance coordination efforts but also point to the lack of funding of various initiatives as part of the stocktaking process. They also ensure that funding issues are taken into consideration and reviewed over time to evaluate: (a) where is the current funding being used? (b) What are the funding gaps to implement the goals of industrial and STI policies? (c) How can the gap be financed? (d) What are the best ways to share risk and partner with industry to effect transformation? (e) How to best allocate existing resources, and into what agencies? (f) Can agencies be streamlined and better defined? These are some of the issues that should form a core part of the monitoring and evaluation exercise.

Monitoring and evaluation exercises aimed at ensuring that existing resources and agency strengths are put to good use will play a pivotal role in policy effectiveness.

In support of this point, the surveys and interviews showed that most funding given to agencies supporting innovation is often spent on recurring expenses related to staff maintenance and running costs, with little or no reserve for innovation support infrastructure. In the United Republic of Tanzania, for example, about 95.1 per cent of the sums allocated to agricultural R&D goes into staff salaries or operating expenses, leaving only 4.9 per cent for capital investments in 2011. Similarly, staff salaries and operating expenses account for about 83.4 per cent and 71.8 per cent of agricultural R&D in Nigeria and Ethiopia, respectively.¹ Similarly, supporting staff account for about 29.3 per cent (2010), 33.6 per cent (2007) and 37.9 per cent (2010) of the R&D expenditure in the United Republic of Tanzania, Nigeria and Ethiopia, respectively. By way of comparison, the share of support staff in relation to R&D personnel is smaller in other developed countries, e.g. Germany (16.8 per cent in 2011) and Japan (16.2 per cent in 2011), as well as in other developing countries with highly sophisticated R&D system, e.g. Hong Kong, China (5.5 per cent in 2010).²

a. Recommendations to ensure efficient use of existing resources

In order to address these issues, the following recommendations could be considered:

- There is a need to integrate monitoring and evaluation from the start of the policy process.
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- There is a need to ensure monitoring and regular follow-up, along with open assessments of budgets and assistance offered by various agencies.
- Monitoring and evaluation should be based on institutional memory of why and how coordination failed, because looking inwards to assess and apply the learning of the country's own past as to why policies failed or what factors vitiated the policy processes helps to promote successful coordination.
- The resources earmarked to support the implementation of relevant policies will largely determine the effectiveness of the policy in question. Hence, policies should be accompanied by resource allocations that are on par with the activities envisaged.

4. Policymaking, government interventions and the business environment should be coordinated more closely

An important finding of this report is that policy is often reality-incoherent. That is, as opposed to the practical structure of the local industry, which is often overwhelmingly comprised of SMEs and the informal sector, industrial policy and innovation policy elaborate sectors of importance that are entirely high-tech, or require an institutional infrastructure that is very far-fetched from the on-the-ground realities that firms face in their day-to-day existence. A number of the local firms are operating on the fringes of technological development even in the so-called high technology sectors. For example, in the ICT sector, many companies simply offer call management or ICT services to users (as opposed to any production or process improvements), in the pharmaceutical sectors, many companies only distribute already packaged medicines, or engage in traditional medicine-based preparations of low-technological nature.

It is important to bring the private sector into the policy focus and the realm of policy discourse in the countries. The STI and industry policy frameworks should be adequately accompanied by both business and industry support organizations, which provide incentives for local firms such as R&D grants, R&D loans, tax credits and governmental procurement, all of which have met with much success in other developing countries. In fact, one of the key issues that were raised in the country studies related to the way the question of finance was addressed.

Countries, such as Thailand, have used policy mechanisms like government procurement as an incentive for innovation.³ Incentives such as these could be considered in all the three countries there were policy implementation gaps on the question of innovation finance.

African countries are at a defining point of stocktaking, particularly as they transition into an era of new development goals. It is becoming widely acknowledged that sustainable development rests more broadly on stable industrial development of a kind that can deliver better livelihoods to the people and eradicate poverty, as several goals of the recently adopted 2030 Agenda for Sustainable Development emphasize. In particular, Goal 9 encapsulates the dual objectives of promoting inclusive and sustainable industrialization and fostering innovation.

Almost all countries in the African region, and more widely in the developing world, including the three countries that were studied in depth for this report, are currently at a policy and developmental stage where industrial development through technological change *should be* a central, if not the most important, priority. Not only is there a policy transition towards that end, the field surveys were testimonies to the extent of political commitment to enacting elaborate industrial policy frameworks, and revising their S&T policies towards policies dedicated to innovation. But the private sector in the African region (particularly in sub-Saharan Africa) is in dire need of greater support, and enterprise policies are currently the weak link.

NOTES

- 1 ASTI website (<http://www.asti.cgiar.org/countries>) accessed on 27 April 2015.
 - 2 UNESCO Institute for Statistics database (<http://data.uis.unesco.org/>) accessed on 27 April 2015. Full time equivalent (FTE) figures were used.
 - 3 See UNCTAD, Promoting Innovation Policies for Industrial Development in Thailand, Forthcoming.
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