This chapter explores the conceptual linkages between regional integration, innovation and competitiveness and revisits innovation and competitiveness as concepts. It then summarizes the empirical evidence, showing that Africa’s growth is not driven by innovation and competitiveness.

**Conceptually linking regional integration, innovation and competitiveness**

To appreciate these three elements and their role in sustained economic growth, it is essential to understand the processes linking them. The starting point is formal and informal institutions (info 3.1 and box 1), which drive regional integration (box 2). Regional integration in turn enhances the framework conditions—formal and informal institutions and market opportunities—of the bloc (box 3), under which economic actors leverage knowledge generated through research and development (R&D) and through routine learning and practice of economic activities (box 4) to innovate (box 5).

From a static-effect perspective, regional integration enlarges markets, reduces the costs of doing business, and eases trade and investment flows. Economic entities (firms, entrepreneurs) can exploit economies of scale and of scope—necessary conditions for innovators to commercialize their intellectual property (IP) assets embedded in knowledge generated through R&D and through non-R&D routine learning and economic activities. Apart from enabling innovators to introduce new organizational models, processes, products and services to the market, innovation—when combined with sound public policies—stimulates factor productivity.

In the medium to long term, the static effects of regional integration are complemented by dynamic effects, triggered by the mobility of capital and people. The modalities underlying these flows influence the spread of knowledge and skills, enhancing innovative capacities and contributing dynamism to the innovation ecosystem. Technology, for instance, enables economic actors to exploit economies of scale (to increase production quantities) and of scope (to diversify production), and to capture value better through downstream movements along the value chain contributing to structural change in production capacities.

Ongoing interactions between both local economic agents (such as individual entrepreneurs, the gamut of enterprises from micro to large, institutions that generate and disseminate knowledge and skills) and external change agents (such as foreign firms, similar institutions to previously, development agencies) contribute to innovation activities and capacities (box 5). This is vital, as the competitiveness of economic entities (at all levels—firm, country, region, and so on), and by extension their ability to meaningfully integrate into value chains require the application of the necessary knowledge and technological capabilities. Tapping external change agencies is also a powerful way to spur technological change through such channels as foreign direct investment, trade and other forces that generate knowledge and innovation.

The exploitation of innovative potential linked to the static and dynamic effects of regional integration contributes to structural transformation (box 6), enhancing competitiveness (box 7) and generating growth (box 8). This underlines the significance of access to and use of technological innovations (internally generated and acquired from external innovators) in driving growth. This model assumes that other supportive policies and capacities are in place.

In practice, the most obvious manifestation of structural change is sectoral allocation, typically characterized by movement towards higher levels of the value chain (higher-value downstream activities). The ongoing process of structural transformation provides a platform...
for further gains in competitiveness (box 7). Increasing levels of competitiveness enable the economy to be set on a trajectory of sustainable economic growth and development (box 8).16 (The arrows pointing in both directions indicate relations and interactions that are mostly dynamic.)

The figure also illustrates how the informal, micro, small and medium-sized enterprises that dominate African economic activities are brought into the dynamic process. They are affected by interactions with endogenous large enterprises and research institutions on the one hand and exogenous actors, like transnational corporations and development partners, on the other. The interactions among these actors are essential for domestic and international knowledge spillovers.

In a nutshell, then:

- Regional integration is both a driver and beneficiary of innovation. It enables favourable framework conditions for innovation (captured by the effects link-
ing boxes 2, 3 and 4). Moreover, when members of a bloc grow in innovative capacities, they are likely to integrate even more with each other through investments and production (value chains), trade and knowledge mobility, and so on (as captured by the dynamic effects linking boxes 2 and 4).

- Innovation is both a driver and beneficiary of structural change in production capacities and the competitiveness that this transformation triggers (captured by the dynamic effects linking triangles 5, 6 and 7). All things equal, by influencing the structural make-up of the economy, innovation generates higher levels of competitive production and trade, which in turn stimulate economic growth and development.

Intuitively, as innovative capacities grow, competitiveness is enhanced. Competitiveness and innovation scores from a sample of 19 countries, including 10 from Africa, supports this hypothesis (info 3.2): all African countries with very low Global Innovation Index (GII) scores are concentrated at the bottom of the Competitive Industrial Performance (CIP) index scores (discussed further below).

Empirical assessments show that innovation (in all its manifestations) affects economic growth through at least four channels:

- **Technological progress embodied in physical capital.** Recent Organisation for Economic Co-operation and Development (OECD) estimates attribute around 0.35 percentage points of annual average GDP growth between 1995 and 2013 to investment in information and communications technology (ICT) capital (OECD, 2015a).

- **Investments in knowledge-based capital (KBC).** According to Corrado et al. (2012), for 1995 to 2007, KBC accounted for around 0.5 percentage points and 0.9 percentage points of annual average GDP growth in the European Union and the United States, respectively.

### Info 3.2—As innovative capacities grow, competitiveness is enhanced

All African countries with very low scores on the Global Innovation Index are concentrated at the bottom of the Competitive Industrial Performance index.

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Source: Based on UNIDO 2013; Cornell University, INSEAD and WIPO (2014).
• **Multifactor productivity growth.** Multifactor productivity growth mirrors increased efficiency in the use of factor inputs (labour, physical capital), and other measurable changes that are largely attributed to (different types of) innovation. In Organization for Economic Cooperation and Development (2015a), multifactor productivity accounted for over 0.7 percentage points of annual average GDP growth between 1995 and 2013 (equivalent to about one-third of total GDP growth).

• **Creative destruction caused by innovation.** New firms enter the market, sometimes growing quickly and thus increasing their market share, replacing other firms with low productivity. Another recent Organization for Economic Cooperation and Development study (2015b) shows the importance of resource re-allocation in driving aggregate productivity growth.

These four channels jointly are responsible for at least 50 per cent of observed economic growth rates. The actual share depends on a country’s level of economic development, phase in the economic cycle, supportive policies and capacities, and so on (Organization for Economic Cooperation and Development, 2015a).

Revisiting innovation and competitiveness as concepts

Towards a contemporary understanding of innovation: the need to contextualize

Despite being a relatively old concept and often used in scientific and layperson’s language, a definition of *innovation* is elusive. Beyond the common denominator of reference to novelty, definitions tend to be contingent and divergent, leading to multiple definitions of the concept in the literature. Three crucial considerations guide how we conceptualize the term:

• Innovations take place in different market contexts and may thus take different paths. This context-specificity has, in recent years, been demonstrated by the co-existence of *classical* and *frugal innovations*, both serving contemporary development needs. The robustness of these two quite different approaches to innovation show that successful innovation means correctly responding to the target market’s signals.

• Considering the range of innovation opportunities and applications in a late-development context, a contemporary understanding of the term must include a broader concept of novelty.

• A balanced definition of innovation that transcends frontier technological progress should focus on at least two issues: context of the innovation and specificity of the market opportunities.

Given all these factors, we here define the concept in a broadened and more appropriately inclusive way:

Innovation is a new way of combining factors of production (that is, natural raw materials, intermediate inputs, physical labour, human capital), so that the resulting output: (i) has practical utility and commercial value, and (ii) differently and/or more appropriately addresses a consumer’s wants. The novelty is manifested by either a new way of combining factors of production, or differently and/or more appropriately addresses a consumer’s wants, or both. Moreover, because markets are not fully integrated (such as in terms of purchasing power, demand for product sophistication and quality), the novelty can be context specific (comparing two markets at different levels of development with different purchasing power, demand for product sophistcations and quality, and so on), or context neutral (when markets are fully integrated in all aspects). Hence, the new combination of factors of production to generate new solutions for the market can address universal (context-neutral) needs or context-specific market needs.

This definition connects innovation and entrepreneurship, both motivated by business opportunity and both involving a combination of factors of production to bring new solutions (tangible products, services, processes, and so on) to the market. It includes translating technology and knowledge into new usable outputs (goods, services, and so on). And most important, it captures innovation in all its manifestations. For countries that are late developers, it puts innovation in the right context.
Characterizing innovation

Table 3.1 presents some basic characterizations. Innovative ideas are the point of departure, although they must in practice be developed and turned into concrete solutions, like new goods or services, processes, or business models.

Innovations can also be multidimensional with one or more simultaneous manifestations. Likewise, innovations are multidisciplinary, often involving dynamic interplay.

A working definition of competitiveness

Although competitiveness is widely used in the scholarly literature and in everyday life, the concept does not have a clear-cut and universally accepted definition. Several (in-context) definitions exist, and allude to a raft of emphases: factor productivity and in particular total factor productivity, diversity of levels (enterprise, sectoral, country, regional, continental, global, and so on), and relationships with such factors as innovation, entrepreneurial acumen, human capital, institutions including policies, locational qualities, market access, and natural endowments.23

However, for a development perspective, and for this report, we adopt the following definition:

Competitiveness is the ability of economic agents that are exposed to competition (internal and external) to produce goods and services that address customer wants and to meet the tastes of target markets (local, national, regional, continental or global), while simultaneously providing “decent” employment, generating and sustaining increasing levels of income.

This definition recognizes the context-specificity of markets and competitiveness. Thus a firm targeting a high-end market may need frontier technologies to achieve its goal; alternatively, a firm targeting the bottom of the pyramid market can achieve the same goal using frugal innovations (see box 6.1).

Table 3.2 presents a simplified summary of the key linkages between competitiveness, innovation and sustainable economic growth in four instructive groups of theories from various branches of economics:

<table>
<thead>
<tr>
<th>Table 3.1. Basic characterizations of innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By type</strong></td>
</tr>
<tr>
<td><strong>Innovation</strong></td>
</tr>
<tr>
<td>(Tangible) product innovation or service innovation</td>
</tr>
<tr>
<td>Process innovation</td>
</tr>
<tr>
<td>Organizational innovation (also: social innovation)</td>
</tr>
<tr>
<td>Organizational innovation (also: social innovation)</td>
</tr>
<tr>
<td>Organizational innovation (also: social innovation)</td>
</tr>
<tr>
<td>Organizational innovation (also: social innovation)</td>
</tr>
<tr>
<td>Marketing innovation</td>
</tr>
<tr>
<td><strong>By other criteria</strong></td>
</tr>
<tr>
<td><strong>Innovation</strong></td>
</tr>
<tr>
<td>Degree of newness</td>
</tr>
<tr>
<td>Form of innovation</td>
</tr>
<tr>
<td>Content of innovations</td>
</tr>
<tr>
<td>Source of thrust-driving innovation</td>
</tr>
<tr>
<td>Source of thrust-driving innovation</td>
</tr>
</tbody>
</table>

*a. This involves improving existing goods, services, processes, business models and so on.

b. This involves developing goods, services, processes and so on that did not exist previously.

Source: Authors’ summary.
Table 3.2:
Key linkages between competitiveness, innovation and sustainable economic growth—four groups of theories

<table>
<thead>
<tr>
<th>1.1. Country-based trade theories: orthodox mercantilism</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key assumptions</strong></td>
<td><strong>Competitiveness drivers</strong></td>
</tr>
<tr>
<td>• Hoarding precious stones and exercising restrictive import policies are sources of competitiveness</td>
<td>• Government policy to ensure trade surplus (orthodox mercantilism)</td>
</tr>
<tr>
<td><strong>1.2. Country-based trade theories: classical mercantilism</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Key assumptions</strong></td>
<td><strong>Competitiveness drivers</strong></td>
</tr>
<tr>
<td>• Competitiveness arises from the edge in capacities to produce various goods and services</td>
<td>• Domestic production support measures</td>
</tr>
<tr>
<td>• Export subsidies</td>
<td>• State-trading enterprises</td>
</tr>
<tr>
<td>• Knowledge and technology monopoly</td>
<td></td>
</tr>
<tr>
<td><strong>1.3. Country-based trade theories: classical trade theory</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Key assumptions</strong></td>
<td><strong>Competitiveness drivers</strong></td>
</tr>
<tr>
<td>• Division of labour triggers inter-country technological differences</td>
<td>• Specialization, leading to economies of scale and inter-country productivity differences (Adam Smith)</td>
</tr>
<tr>
<td>• Inter-country technological differences lead to inter-country productivity differences</td>
<td>• Market expansion due to trade (Adam Smith)</td>
</tr>
<tr>
<td>• Factors of production (such as labour) are perfectly mobile across sectors, within a given country</td>
<td>• Economic growth (driven by trade)</td>
</tr>
<tr>
<td>• Trade is based on absolute cost advantage in the production of goods and services (Adam Smith)</td>
<td>• Production technology differences across countries, leading to differences in comparative labour productivity (David Ricardo)</td>
</tr>
<tr>
<td>• Trade is based on comparative advantage (David Ricardo)</td>
<td>• Production technology differences across sectors, leading to differences in comparative labour productivity (David Ricardo)</td>
</tr>
<tr>
<td><strong>1.4. Country-based trade theories: neoclassical trade theory</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Key assumptions</strong></td>
<td><strong>Competitiveness drivers</strong></td>
</tr>
<tr>
<td>• Same technology (perfect information) across countries</td>
<td>• Constellation of factor endowment (labour and capital)</td>
</tr>
<tr>
<td>• Perfect competition (due to constant returns to scale and full divisibility of factors of production)</td>
<td></td>
</tr>
<tr>
<td><strong>2. Firm-based trade theories</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Key assumptions</strong></td>
<td><strong>Competitiveness drivers</strong></td>
</tr>
<tr>
<td>• Key theories in this group include country similarity, global strategic rivalry, imperfect competition, product differentiation, Porter’s competitive advantage of nations, product life cycle, scale economies</td>
<td>• Policy</td>
</tr>
<tr>
<td>• International trade flows are explained by many factors (see competitiveness drivers)</td>
<td>• Localized technologies</td>
</tr>
<tr>
<td>• Technology is an explicit and endogenous factor of production; with imperfect mobility (across firms, countries)</td>
<td>• Skilled labour</td>
</tr>
<tr>
<td>• Factors of production (such as labour) are perfectly mobile across sectors, within a given country</td>
<td>• Specialized infrastructure</td>
</tr>
<tr>
<td><strong>3. Investment theories</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Key assumptions</strong></td>
<td><strong>Competitiveness drivers</strong></td>
</tr>
<tr>
<td>• Key theories in this category include ownership advantage theory, internationalization theory and eclectic theory</td>
<td>• Ownership of productive assets (ownership advantage theory)</td>
</tr>
<tr>
<td>• Competitiveness is driven by various factors</td>
<td>• Costs associated with market access and market entry (internationalization theory)</td>
</tr>
<tr>
<td><strong>4.1. Development theories: Keynesian theory</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Key assumptions</strong></td>
<td><strong>Competitiveness drivers</strong></td>
</tr>
<tr>
<td>• The existence of the following linear relationship: Income $\rightarrow$ savings $\rightarrow$ investments $\rightarrow$ production $\rightarrow$ economic growth</td>
<td>• Capital intensity</td>
</tr>
<tr>
<td>• Existence of market imperfection cannot be corrected by the market</td>
<td>• Government (interventionist) policy</td>
</tr>
<tr>
<td>• Economic growth is circular, characterized by ups and downs</td>
<td>• Government spending</td>
</tr>
<tr>
<td>• Labour and capital are complementary factors of production</td>
<td>• Investment</td>
</tr>
</tbody>
</table>
### Country-based trade theories

- **Key assumptions**
  - Evolutions of science and technology are driven by changes in both economic and social spheres
  - Exogenously driven development in developing countries is through interactions with developed countries
  - Western-style capitalism is the only pathway to development

### Firm-based theories

- **Key assumptions**
  - Market is a better allocator of resources than the government

### Investment theories

- **Key assumptions**
  - Science and technology

### Development theories: modernization theory

- **Key assumptions**
  - Evolutions of science and technology are driven by changes in both economic and social spheres
  - Exogenously driven development in developing countries is through interactions with developed countries
  - Western-style capitalism is the only pathway to development

### Development theories: neoliberal theory

- **Key assumptions**
  - Market is a better allocator of resources than the government

### Development theories: endogenous growth theory (new economic growth theory)

- **Key assumptions**
  - Long-run growth emanates from economic activities that create new technological knowledge
  - Accumulation of knowledge generates increasing returns
  - Sustainable growth relies on activities determined by forces internal to the economic system that facilitate the creation of new technological knowledge

### Development theories: dependency theory

- **Key assumptions**
  - Development in developing countries has been stifled by mercantilist relations with developed countries

### Development economics theories: Rostow’s stage theory of development

- **Key assumptions**
  - Development occurs through stages
  - The market cannot work

### Development economics theories: Myrdal’s hypothesis of circular and cumulative causation

- **Key assumptions**
  - The development achievement of countries differs
  - Economic policy is a key tool for managing development process and address the international and interregional development gaps

### Africa’s innovation and competitiveness performance

Africa does not perform well on many measurements of innovation and competitiveness. For innovation, two useful measurements are the above-described Global Innovation Index, co-produced by the World Intellectual Property Organization (WIPO), Cornell University and the Institut Européen d’Administration des Affaires, and the Networked Readiness Index, compiled by the World Economic Forum.

The Global Innovation Index is divided into pillars, further divided into subpillars, each composed of individual indicators (for 81 in total). The pillar scores are calculated as the weighted average of subpillar scores, while subpillar scores are calculated as the weighted average of individual indicators. The five pillars of the input subindex are institutions, human capital and research,
infrastructure, market sophistication and business sophistication. The limitation of this approach is that they present prevailing conditions for innovations, (that is, elements of the national economy that enable innovative activities), rather than innovation as such. The two pillars of the output subindex (knowledge and technology outputs, and creative outputs) are more helpful, because they present the results of innovative activities within the economy.

According to the latest (2014) Global Innovation Index rankings of the performance of 143 countries and economies around the world, including 33 from Africa (figure 3.1), many developing countries are performing impressively. Asian countries are doing particularly well: Singapore and Hong Kong (China) are in the top 10, followed by China (29th), and Malaysia (33rd). Africa’s innovation record is, however, subdued. Its best performer, Mauritius, was 40th, and 5 of the 10 countries that scored the lowest were African—and only 11 African countries appeared in the top 100.

Of the 33 African countries ranked in 2014, rank improvement was recorded for 17, with Côte d’Ivoire showing the biggest improvement (20 places) and Mauritius improving by 13 places compared to 2013. Five countries (Burkina Faso, Gambia, Malawi, Mozambique and Rwanda) joined the status of “innovation learner” economies (that is, developing countries outperforming their peers in their respective income groups).24

The Network Readiness Index measures the propensity for countries to exploit the opportunities offered by ICT, an innovation enabler. The Index is a composite of three components: the environment for ICT offered by a given country (market, political, regulatory and infrastructure environment), readiness of the country’s key stakeholders (individuals, businesses and governments) to use ICT; and stakeholders’ actual use of ICT. From a late-development perspective, the Network Readiness Index is especially useful given the endless possibilities that arise from applying ICT. The Network Readiness Index 2014 rankings are for 148 countries, but only seven are African, the highest ranked being Mauritius (48th), Seychelles (66th) and South Africa (70th). All these results underline the need for more robust science, technology and innovation STI policies (chapter 5).

**Figure 3.1.**

Global Innovation Index scores in 2014—top 10 and bottom 10

Source: Based on Cornell University, Institut Européen d’Administration des Affaires and WIPO (2014).
Some competitiveness indexes, despite inherent limitations, give clues about Africa’s performance in the global economy. Two of the more rigorous are the Competitive Industrial Performance index and the Global Competitiveness Index.

The Competitive Industrial Performance index is one of the better indexes with a bearing on innovation. Produced by the United Nations Industrial Development Organization, its focus is on countries’ capacity to produce and export manufactured goods competitively—a key concern for Africa’s structural transformation. In the 2013 computations this composite index covered 133 countries. Among the 12 lowest-ranked countries, 10 were African (figure 3.2 left panel). When African countries are ranked, South Africa is ranked highest with a score of 0.0722 (41 globally)—the only country considered industrialized—followed by Tunisia (58th), Egypt (62nd) and Morocco (66th).

Are African countries catching up or falling behind on industrial competitiveness? A sober response is “falling behind.” Even de-industrialization is appearing—this in a continent that has not yet taken off industrially.

Categorizing products by the technology used to produce them (high, medium, low) helps indicate innovation-driven competitiveness. But here, too, the news is not good: most African countries’ manufactured goods exports (to the degree it has them) use low technology (United Nations Industrial Development Organization, 2013).
Globally, 144 countries were ranked in the 2014–2015 edition of the Global Competitiveness Index. Most of the top positions are occupied by European and Asian countries, most of the bottom slots by African countries (the bottom two and seven of the last 10) (figure 3.3). From Africa, 38 countries were ranked in the 2014–2015 Global Competitiveness Index. The highest ranked was Mauritius at 39, globally. At the other end, African countries occupy the last two positions, and makeup seven of the bottom 10. Using both indexes (Competitive Industrial Performance index and Global Competitiveness Index), 15 African countries are among the bottom global 10.25

Most African countries (23 out of 37) are still stuck at the first of three stages of economic development (table 3.3)—their economies are factor driven and they lack the conditions to catapult them onto the path of structural transformation. Not a single African economy is innovation driven.

Africa’s growth is not, therefore, driven by innovation and competitiveness. The evidence on Africa’s innovation and competitiveness is consistent with the evidence that Africa’s recent growth spurt was relatively weak, driven mainly by a favourable commodity market environment. The continent as a whole registered economic growth rates faster than 4 per cent from 2000 to 2014, but over the long term (1975 to 2014), Africa’s growth was far below the average of Asian developing countries (figure 3.4), where innovation and competitiveness play a far greater role. After peaking in 2005, Africa has been growing much more slowly.
Innovation capacities are crucial for the continent to diversify and differentiate—transform—what it produces and trades. Manufactured goods contribute minimally to merchandise export growth, which is still driven by commodities (figure 3.5).

Another undesirable feature of Africa’s economic ecosystem that is linked to lack of structural transformation is that African countries flood the market with the same traditional commodities and force down the prices of these goods, lowering profits (Spence, 2011). Transforming the product portfolio is vital to counter this.

Figure 3.3.
Country scores of Global Competitiveness Index, 2014–2015

Note: Lowest 10 scores (equivalent to ranks 144 to 135) and highest 10 Global Competitiveness Index scores (equivalent to ranks 1 to 10). Global Competitiveness Index scores by 38 African countries (equivalent to highest rank of 39 for Mauritius, and lowest rank of 144 for Guinea).

Source: Based on WEF (2015).
African countries need innovation-driven growth models

The main conclusion from this chapter’s review of conceptual issues and linkages is that African countries need to pursue mutually reinforcing policies on growth, innovation and competitiveness, including:

- Expanding and deepening the stock of human capital through the tertiary education system and prioritizing science, engineering, technology and mathematics, particularly their quality, to allow countries to absorb and adapt technology.
- Exploiting the opportunities for innovation provided by intra-African integration schemes (subregional, regional, continental).
- Leveraging broader international cooperation to back Africa’s innovation endeavours, especially through collaborative and open innovation.
- Leveraging the market potential of the demographic dividend as Africa’s middle classes grow steadily.
- Targeting the continent’s “bottom of the pyramid” through frugal innovations (chapter 6).
• Harnessing natural resource wealth, and the intellectual property assets embedded in them, such as biodiversity (chapter 4).

• Taking full advantage of cultural assets and traditional knowledge systems. The intellectual property assets embodied in culture and traditional knowledge is ready made for enhancing innovation capacities (chapter 4).

African countries need to build innovation-conscious and innovation-capable societies—some of the necessary conditions for innovation-driven economies. They must therefore systematically develop and nurture all elements of an innovation ecosystem: domestic knowledge and skills capacities (including absorption capacities), basic research (to produce innovation-supporting technologies, R&D), effective knowledge dissemination and skills development systems, and innovation-enabling infrastructure. Certain technologies like ICT should receive special attention because they are inherently innovation enabling (chapter 5). Mauritius is an African nation that “can do it.” Others should follow.
References


