

Chapter 2

Technology Transfer For Economic Growth In Africa—Why It Matters

2.1 Introduction

Africa still remains the continent with the lowest level of technology deployment in all aspects of human productive and even leisurely activities. There is shockingly limited deployment of productive technology or capital equipment in production activities such as agriculture, fisheries, processing of basic products (foods items and clothing), construction and associated materials, and manufacturing of basic transportation equipment such as bicycles. This problem constitutes what the author aptly calls Africa's technology gap problem tree. The imagery of a tree is quite convenient when one thinks about roots, stems and branches and their unbreakable interrelatedness. Poverty bedeviling Sub-Sahara African countries is very much closely intertwined with the low usage of productive technologies in various economic and social activities in the continent. Pervasive poverty, low productivity and associated low wages, lack of jobs, and negative terms of trade are all linked to Africa's technology gap problem tree. It is logical to assert that African economies cannot experience inclusive economic development unless the technology gap problem tree is solved. The most vexing question is how can Africa's technology gap problem be solved?

While most Western countries experienced technological development that progressed in tandem with economic activities, countries in East Asia, starting with Japan have demonstrated how catch-up strategy in technology-based economic growth and development can happen. Japan's success in technology-based economic development relied on massive foreign technology imports actively put to usage, improvement, mastery, and finally innovation, thus marking the crossing over from a net technology importer to an exporter. Morishima (1982), aptly explained and summarized the Japanese successful experience as predominantly based on Western technologies and Japanese ethos. Similarly, other countries such as Korea, Taiwan, Singapore, and lately China have also demonstrated what is possible, and what it takes to experience technology-based economic growth and

development, starting out with imported productive technologies. At the center of all the technology imports and deployment in diverse economic activities is the subject of technology transfer and what it entails.

Technology transfer is a very much tortured and gravely misunderstood subject, starting even with its very meaning. I was taken a back, to be exact shocked when in a meeting with some Japanese government agency officials in charge of promoting external trade and investments. Our meeting was to find out about possible working partnership between their agency and a small start-up company we founded with the mission of promoting technology transfer from Japan to African countries. The officials expressed fear and consternation over the subject matter of technology transfer. Simply expressed, technology transfer meant a process of dispossessing Japanese firms of their technologies and taking it to African countries. In a nutshell, our startup firm was on a zero-sum game mission. And the loser was to be obviously the Japanese. So the question that concerned the Japanese officials was whether such a dreadful subject matter would be acceptable to Japanese firms owning the various technologies. Noting that the questions and concerns were emanating from people charged with promoting external trade and investments, I suddenly realized how the subject matter of technology transfer is grossly misunderstood even by those should be in the know in the first place. This book lays the matter of fear, confusion and lack of understanding of technology transfer to rest by giving a clear definition that even laymen should understand. We need to know what has to be transferred, the components, and also conditions under which successful transfer process can happen. It is worth noting technology comprises of a number of components, and is like a seed which must find fertile and prepared ground, and once planted, must be watered, nurtured based certain capabilities. If these conditions and capabilities are direly lacking, then the seed must die or altogether a withered sickly plant destined to die will be the end result. In the parlance of technology and economic growth studies, we call these conditions absorptive capability.

It is within the light of contextualized experiences of these countries with technology-based economic growth and development that this book makes a bold commitment to contributing a pragmatic approach and specific lessons to how African economies can initiate their own technology-based economic development. This book is therefore of immediate and lasting use to African private sector practitioners (corporate managers and entrepreneurs), public policy makers at national and supranational levels, and even private sector development executives at development banks.

This work is concerned with how sub-Sahara African (SSA) countries can succeed in initiating technology-based economic development through technology transfer, absorptive capacity building with specific reference to manufacturing and related service sectors. This work is grounded on a view of technology transfer as a continuous process in which upgrading of skills and abilities at various levels is necessary. Therefore, technology transfer requires efforts aimed at absorptive capacity building on the part of SSA countries. Otherwise any attempts at technology transfer will remain exercises in futility. The view of technology transfer as

a continuous process is clearly supported by Rosenberg (1982: 272), thus it should be rightly conceived of, not as a one-time event, but as a continuous process.

In order of complexity, the process of technology transfer may involve learning how to operate machines, carry out maintenance and minor repairs, implementing minor innovations, and finally at the last stage, the design and development of new products and manufacturing processes. Usually research and development (R&D) culminating in new products, production processes, hardware and competitive knowledge is the pinnacle in any technology-learning effort. The experience of Newly Industrialized Countries of East Asia has followed this described process of technology transfer, which engenders economic growth. Without incurring the risk of oversimplification of the process of technology transfer and economic growth, it is pertinent to clarify that actual execution of technology transfer is far more complex, with diverse issues involved. In the actual execution and realization of the processes and stages of technology transfer, a wide range of organizational and managerial tasks must be dealt with in addition to the purely technical aspects of technologies. It is also notable that even before beginning the task of learning how to operate machines, acquisition capability (mainly dealing with interventions in markets to gain access and purchase of a given technology) is requisite. The acquisition capability can be a complicated task involving from simple to complex knowledge of machines and technologies, knowledge about potential suppliers and their merits, organizing for financing, and negotiation of terms of purchase.

Therefore organizational, managerial and technical aspects of technology transfer will be discussed in this book. Precisely, the most important, yet also the most challenging task for SSA countries is the management of the continuous process of technology transfer. In past technology transfer studies, that continuous process has been conceptualized as technology capability building (the term ‘capacity’, is also used interchangeably with capability. Abramovitz (1986) uses the term ‘social capability’ instead of technological capability. However, such seemingly novel reference is a borrowing from Rosovsky’s account of Japanese economic development as detailed in Okawa and Rosovsky (1973). In essence, Abramovitz simply served to popularize the term—social capability or technological capability. Conceptually and in meaning, social capability is the same as technological capability/capacity as used by Rosenberg (1982), Westphal et al. (1985). However in most literature on technology transfer, the term technological capability is used more often than social capability. It is however, not the aim of this book to delve into conceptual arguments about technological capability since this is an issue that has been sufficiently covered in some of the past researches by Ohkawa and Rosovsky (1973), Rosenberg (1982), Westphal et al. (1985), Kim and Nelson (2000), Abramovitz (1986 and 1989) Nelson (1990), and Lall (1992). Later researches into the subject of technology transfer and capacity building have tended to take the conceptual issue of technological capability as given by the past research work. It would therefore be rational to resign to the idea that the conceptual issue has been adequately dealt with. In any case, this work on SSA is more focused on action-oriented knowledge because that is what the region urgently needs.

A successful process of technology transfer is synonymous with ‘technology learning’ (see Nelson 1990) has not been associated with the experience of developing countries, more so SSA countries. Unlike Western countries in which economic and indigenous technological developments evolved simultaneously, developing countries must deal with economic and technological developments separately. Developing countries must import technologies from other countries and must at the same time make efforts at building absorptive capacity needed for successful grafting of such imported technology to contribute to economic growth. Economic historical experience shows that many countries deploying convergent and divergent approaches have attained different industrialization results. A clear emergence of difference between developing countries in other part of the world and the SSA region, regarding ability to absorb and effectively use imported technology. As would be discussed later, it is crucial to point out that the SSA countries exhibit the widest technology gap as compared with other developing countries.

The ability to import technologies developed elsewhere (acquisition capability), and to effectively deploy imported technology in economic activities is what separates star performers and laggards in economic development and growth. The study and analysis of the difference in effective use of imported technologies has led to a plethora of research trying to explain differences in performance between countries and regions. The principal mission of most of these studies is the extraction of technology-based economic development lessons derived from successful cases. However, this book adds on to the trend to draw lessons from successful experiences by stating that it is pertinent to also learn from less successful and even outright cases of failures. SSA countries can draw vital lessons in technology-based economic development and growth of a number of East Asian economies. It is widely known that a number of East Asian economies have transformed themselves through continuous technological capability building—thus some of these countries have even completely undergone transformation from being net technology importers to net technology exporters. It is worth observing that at a certain point in time, some of the successful East Asian countries were at par with Sub-Sahara African countries in terms of macro-economic and human development indicators (HDI). The notable case is that of Ghana and South Korea, two nations that were at par in terms of *per capita* GDP in 1957, but three decades later the Korean *per capita* incomes were 10 times that of Ghana according to The World Bank study (World Bank 1993). Although a host of mutually reinforcing negative factors such as failed macroeconomic policies and dysfunctional institutions have been fingered for Ghana’s poor economic development performance as compared to Korea. This book makes the emphasis that all the factors cited worked to negatively impact Ghana’s socio-economic environment in which imported technology could have been deployed to improve productivity. Precisely Ghana failed to acquire and deploy technologies in economic activities due to the macroeconomic and institutional weaknesses. Table 2.1 shows the comparisons in capita between some SSA countries and that of Korea and others.

Table 2.1 Comparative growth experience

Country	Per capita GDP 1960 (1985 dollars)	Per capita GDP 1989 (1985 dollars)	Per capita GDP growth (1960–1989) (%)
South Korea	883	6206	6.82
Taiwan	1359	8207	6.17
Ghana	873	815	−0.54
Senegal	1017	1082	0.16
Mozambique	1128	756	−2.29
Brazil	1745	4138	3.58
Mexico	2798	5163	2.36
Argentina	3294	3608	0.63

Source Adopted from Penn World Table 5.5

The glaring technology-based economic development disparity between the successful East Asian countries and the SSA countries can be better understood by simply looking at manufacturing performance. SSA countries have had lamentable performance in manufacturing sector as evidenced by the manufacturing performance data for 1990–1997 (UNIDO 1999), in which SSA countries' manufacturing value added grew at a miniscule figure of 0.1 % per annum. South Africa was the only exception to this dismal performance. A look at the figures for the period 2007–2010 does not look encouraging as shown in Table 2.2. We need to subject the figures to correct analytical interpretation. First it is important to take note of the small size and structure of the GDP of most of the SSA economies when interpreting the data. For instance a country like Swaziland's economy being small in GDP size means that a rate of value addition at 44 % is not a significant mark of manufacturing activity. In addition, such a big part of manufacturing value added can be only be attributed to a few companies, most likely large multinational enterprises. This same logic can be extended to countries like Mozambique, where large companies like Mozal the largest aluminum producer in Africa contribute majority share of value added in manufacturing.

Comparison of regional figures for manufacturing value added shows a similarity in low level of manufacturing activity therefore strongly confirming that the entire region faces same challenges. This is of course with only the exception of South Africa. Table 2.3 depicts such similarity based on data for manufacturing value added for each region. It is notable that the Southern African region is higher due to the inclusion of South Africa.

Table 2.2 Manufacturing, value added (% of GDP), selected African countries

Country name	2007	2008	2009	2010
Angola	5	5	6	–
Botswana	4	4	4	3
Congo, De. Rep.	6	6	5	–
Congo Rep.	4	3	4	4
Cote d'Ivoire	18	18	18	19
Ethiopia	5	5	4	5
Gabon	4	3	4	4
Ghana	9	8	7	6
Kenya	9	9	9	8
Lesotho	20	19	16	16
Madagascar	14	14	14	–
Malawi	10	10	10	–
Mozambique	15	14	14	13
Namibia	17	14	15	8
Rwanda	6	6	6	–
Senegal	14	13	13	13
South Africa	17	17	15	–
Swaziland	44	44	45	45
Tanzania	9	9	10	10
Uganda	8	8	8	8

Source World Bank national accounts data

Table 2.3 Manufacturing value added in Africa (regions)

	Simple average [weighted average] (percent of total GDP)					
	2002	2003	2004	2005	2006	2007
Africa	10.8 [14.2]	10.7 [13.8]	10.6 [13.3]	10.3 [12.9]	10.4 [13.4]	10.7 [13.6]
East	8.7 [8.7]	8.5 [8.6]	8.6 [8.6]	8.3 [8.4]	8.0 [8.3]	8.4 [8.8]
West	8.5 [7.2]	8.5 [6.8]	8.67 [6.6]	8.7 [6.4]	7.9 [5.8]	7.5 [5.4]
Central	8.9 [12.5]	8.8 [12.3]	8.0 [11.3]	7.8 [10.5]	8.0 [10.6]	9.2 [11.7]
North	12.8 [15.4]	12.3 [14.6]	12.0 [14.2]	11.6 [13.7]	12.2 [15.7]	12.7 [15.8]
Southern	15.8 [17.7]	16.2 [17.5]	15.8 [17.1]	15.3 [16.6]	15.8 [16.4]	15.9 [16.3]

Source United Nations Economic Commission for Africa (UNECA) calculations based on World Bank (2008a), UNECA and African Union (2009)

2.2 Technology Imports and Technology Learning

The emergence of clear technological capability difference between SSA countries and that of successful East Asian economies (also herein referred to as Newly Industrialized Countries of East Asia) merits study given that such difference has emerged over a period of about five decades. In fact the real differences began

showing only after the first decades beginning from the 1960s, and such difference has continued to widen as we approached the new millennium. The Newly Industrialized Countries (NICs) of East Asia have managed to build their technological capability, and hence global market competitiveness as importers of technology. Imports of technologies from foreign markets was the first catalytic step towards building national technological capability and it points to the importance of paying attention to the issue of technology transfer (also closely intertwined with technology learning) and absorptive capacity building. However it is important to note that imports of production equipment such as factory plants is only the beginning of technology transfer, and in fact is a small part of the entire picture given that other channels of transfer have been used effectively by the NICs. There are informal and formal channels of technology transfer, and the national ability to effectively use and optimize results from each channel tends to be closely related to national absorptive capability. Precisely, it is plausible to assert that technology transfer itself is very much a learning process, therefore commitment and ability to learn is critical to success or failure of national technology efforts. The next section of this book while delving into a framework of analysis, will also give a comprehensive definition of technology in order to give clear understanding of what transfer process means. Again such comprehensive definition serves the purpose of giving insights into what channels of technology transfer can be most effective based on targeted technology and hence knowledge embodied.

2.3 Focus on Manufacturing and Related Service Sector Technologies

This book focuses on manufacturing and related service sector technologies. A justification for the choice of manufacturing and related service sector technologies is based on the extant undesirable narrow industrial base of most SSA countries, with exception of South Africa. Such narrow industrial base can be viewed as a serious challenge to economic growth and development generally when it is rightly perceived in terms of technology gap. SSA technology gap is alarming and urgently requires focused policy and pragmatic remedial attention. Figure 2.1 depicts how SSA technology gap problem systemically leads to a host of other problems.

D is the duality index, Q_1 being product per worker in say agricultural rural sector, and Q_2 being the product per worker in the urban manufacturing sector. We can go a head to derive the values of Q_1 and Q_2 as follows:

$$Q_1 = \frac{V_1 P_1}{L_1}; \quad Q_2 = \frac{V_2 P_2}{L_2}$$

In this case V_1 and V_2 are the real product per worker in agricultural rural and manufacturing urban sectors, P_1 and P_2 are the prices for products from the two sectors, and L_1 and L_2 indicates labor size in the two sectors. We take the relatively more productive manufacturing sector as having a higher capital-labor ratio, K_2^* compared to the agricultural sector K_1^* . The values of K_2^* and K_1^* can be expressed as:

$$K_1^* = \frac{K_1}{L_1}; \quad K_2^* = \frac{K_2}{L_2}$$

V_1 and V_2 are aggregate functions of capital and labor, so can be expressed as:

$$V_1 = f(K_1, L_1); \quad V_2 = f(K_2, L_2)$$

Real product per worker can be expressed as:

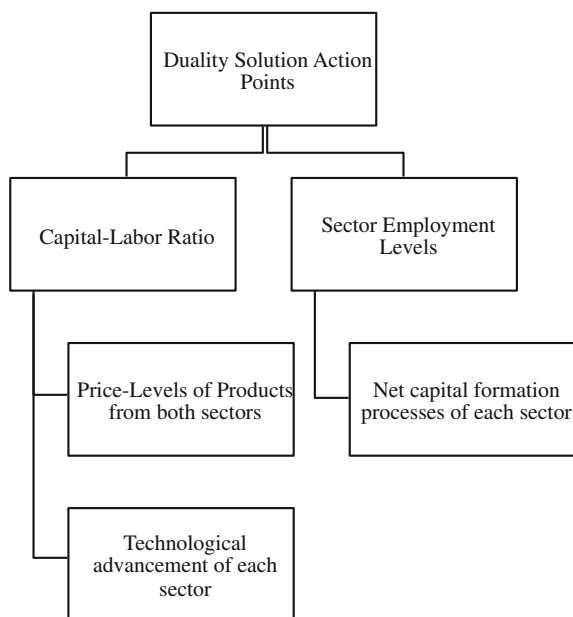
$$V_1/L_1 = \phi(K_1^*); \quad V_2/L_2 = \phi(K_2^*)$$

So long as the capital-labor ratio remains high for the manufacturing sector relative to the agricultural sector, the productivity and incomes will remain far higher than those for the agricultural sector, and so long as no technological progress accompanied by significant rise in factor prices, duality condition will continue to prevail. So how can we attack the problem of duality in economic structure based on the explanations? We must look at the causes of duality and its dynamics, which from the above cause-effect expressions, we can summarize as five-action points to obtain relative changes between any of two sectors defining duality in economic structure as given in Fig. 2.2.

2.5 Dynamics and Intervention Points for Solving Duality in Economic Structure

See Fig. 2.2.

Fig. 2.2 Duality intervention points. *Source* Author's creation



2.6 Japanese Economic Development: Solving Duality in Economic Structure

Fast and sustained economic growth is a fundamental requisite for poverty eradication and tackling of the problem of duality in economic structure. This is validated by Japanese economic development history, and recently that of China where near to half a billion people have been lifted out of poverty, while many rural locations have been opened up for modern industrial and infrastructure development. However, specific macroeconomic policies and private sectors practices are equally important in meaningful implementation of anti-poverty measures and reduction of problem of duality in economic structure. The role of private sector in economic and social development goals is indisputable, and therefore by extension the macro-level managerial practices and policies of corporations deserve scrutiny in economic development discourse. This is with regard to how macro-level private sector managerial practices may contribute to solving poverty, reducing income inequality, and even rural-urban income disparity. Valuable lessons abound in the Japanese post-war period marked by fast growth and distinctive corporate managerial practices rooted in the socio-economic context and dynamics of that time. The post-war period was marked by high unemployment rates, while at the same time shortage of skilled workers prevailed.

While the Korean War became a game changer triggering and ushering in post-war Japanese economic growth, companies had to either contend with

poaching skilled workers from rival firms or had to develop skills of freshly hired workers in-house. Poaching skilled workers was simply unsustainable given the shortage of skills. However, in-house training of freshly hired workers posed its own challenge of capacity building cost, and sometimes even the lack of trainers in cases where companies had to engage in totally new production activities. Against this backdrop, it is notable that Japanese companies at a macro-level adopted in-house training and long-term nurturing of skills of their workers.

The concept of on-the-job training, continuous learning and upgrading of industrial and production skills was born and became firmly rooted in the Japanese managerial practices. This practice was pivotal in lifting a chunk of the country's population out of unemployment, but even more significantly, it guaranteed improvement in income levels as the workers improved their skills and productivity. Obviously with productivity increase, wage increases become sustainable. The remuneration system of the Japanese companies during this era also deserves mentioning here. The companies adopted a useful and pragmatic concept of living wages, which meant that workers were paid based on the living cost needs and wage increments and adjustments conformed to real life needs of the workers. The wages peaked when workers financial needs also peaked i.e. when they needed to pay college tuitions for their children. An elaborate and carefully thought social benefits system accompanied the human resource training and remuneration system. A distinctive element of the social benefits system was the provision of housing and support of transportation needs of the workers most of whom were recruited from far-flung rural locations. In addition, majority of the companies also created cafeteria facilities for their workers.

The Japanese economic development experience also teaches us something about economic development process. Whereas the late Nobel laureate Arthur Lewis posited that surplus labor in the subsistence agricultural sector could smoothly transit to the manufacturing sector, and that through capital accumulation and reinvestments, an economy will eventually modernize, empirical evidence from many developing countries struggling with economic development process suggest otherwise. Such smooth transition has failed to happen, and industrialization has remained at bay. However when we look at the Japanese economic development experience, we can draw a vital lesson in how labor transition actually happened. This was not due to an automatic market mechanism where expansion in the manufacturing sector and rising wages necessitated the absorption of the surplus labor from agricultural sector. Rather we do see that in Japanese economic development history, the pragmatic cooperation between labor and capital owners was one of the critical positive contributors to solving the perennial problem of labor resistance to adoption of technologies that negatively impact employment opportunities. Through such cooperation, it became possible for Japan to adopt new technologies in productive activities, while owners of capital took on the cost of training and retraining of workers. This represents an economic model beyond the confines of market mechanism. It is a model that conforms to the 21st Century, the novel thinking of shared-value, both in terms of creation of value and allocation of the proceeds of value created. We need to move beyond obsession with markets

mechanisms, because market mechanisms left to themselves don't work well and fast enough in ensuring a smooth labor transitioning and expected rise in productivity and technology progress. This viewpoint is to sound a clarion call for organizational innovations, both at micro-level, institutional and macro-levels, which are further expounded on in the next section.

Targeting the problem of duality as suggested above presents a simplified, but yet a strategically powerful model for attacking poverty for a number of compelling reasons. First, tackling the problem of duality in economic structure is a pro-growth model in the sense that it is premised on optimal allocation of resources to both urban and rural parts of the economy. Therefore, it facilitates the freeing of productivity-raising potential of both rural and urban sectors, while at the same time bringing positive social impact on rural urban migration. We note here that rural urban migration spawned by pervasively unequal development is a destabilizing phenomenon on both planning for provision of public urban facilities and while for rural sector, such migration is a drain on agricultural labor, and other potentially productive activities in the rural sector. Secondly other problems such as food insecurity can only be solved by tackling the problem of duality in economic structure once we are able to determine that there inter-causal relations. With an equally productive rural sector, it is not hard to see possibilities of a flexible labor market in which even some urban dwellers actually willingly move to the rural sector as agricultural labor. Lastly, we can argue that tackling the problem of duality facilitates competition in an economy, and competitive pricing of agricultural products in urban sectors become a reality.

2.7 Infrastructure Development

To complete the picture of how Japan was able to solve the duality problem in economic structure, we have to add that provision of infrastructure such as roads, railways, water systems and telecommunications played a very important role in the leveling of rural- urban incomes through improved productivity. Again as stated in the introductory part of this chapter, sound macro-economic policies well implemented by competent national institutions is key to tackling the problem of duality in economic structure. It may sound like asking too much of any developing country given the near-mutual exclusivity between a developing country and competent institutions, but we must note the progressive human potential for learning and change. The situation is not permanently static. The need for change in policy and action approaches to problem of duality in economic structure is an urgent one—noting that urgency brings both positive and negative consequences. Positively, the urgent need for change can lead to putting in place measures leading to creation of sound institutions. On the other hand, urgent need can lead to desperate and social-economically expensive measures in a situation of complete lack of technical and even moral preparation by poor countries.

2.8 Non-linear Relationship Between Science and Technology Education and Industrial Technology Outcomes

The fact that primary commodities dominate the exports of these countries is a clear indication of the underdeveloped state of manufacturing sector of SSA countries. With unprocessed commodities, these countries enter international markets disadvantaged in trade due to lower prices as compared to processed, value added and packaged products. Invariably, price fluctuation and low elasticity of demand for primary commodities can only mean one thing, that is serious constrain to optimizing economic development and growth benefits accruing from active participation in international trade. As a matter of worthwhile observation, manufacturing activity orientation need not be only export oriented, but must also be geared toward serving local and regional consumption needs. It is notable that difficulties and barriers exist when a producer attempts making products for a market it does not understand such as in export markets in geographically far-flung locations. There has to be quite some good local understanding of the needs of end user of a product. This simple logic applies directly to lots of mineral resources exported from SSA countries. African countries have not been major consumers of metals such as copper, iron ore, chrome, and aluminum amongst others. Likewise agricultural commodities imported out of SSA have also faced similar difficulty and barrier in the sense that some products such as cocoa and even coffee are never mass consumed locally. This type of problem can be overcome through focused learning and assistance from trade promotion and product quality and standards organizations of countries targeted as export markets. On the other hand the African consumer markets are still at an infant stage, not just in terms of market formation, but also regarding level of value addition to products manufactured from local resources for domestic consumption. For instance great opportunity exist in manufacturing of agricultural products for domestic and regional market consumption. In fact the convergence between agriculture and industry presents great opportunity for light industrialization for Sub-Sahara African countries, subject to increasing productivity of the agricultural sector to allow production of surplus produce exceeding the needs of immediate consumption.

Unlike the 1970s and 1980s era of ineffective import substitution policies in most SSA countries, current conditions characterized by high growth in fast moving consumer goods market is favorable for launching technology-based economic growth. Such promising markets are supported by two trends—the increasing openness of regional common markets such as East African Community, comprising of six countries with a population of about 134 million as can be gleaned from Tables 2.4 and 2.5. In addition to the nascent formation of larger markets, the rate of urbanization growth is relatively high in SSA countries, and this can only mean one thing, larger markets that can be accessed cost-effectively. The rate of urbanization is also what partly contributes to increasingly higher population

Table 2.4 East Africa—mid year population (million persons)

Partner state/years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Burundi	6.7	6.8	7.0	7.2	7.4	8.0	8.0	8.0	8.1	8.2	8.4
Tanzania	32.8	33.9	34.4	35.3	36.3	37.3	38.0	39.4	40.7	41.9	43.9
Uganda	22.6	23.3	24.1	24.9	25.7	26.5	27.6	28.6	29.6	30.7	31.8
Kenya	30.4	31.3	32.2	33.2	34.2	35.1	36.1	37.2	38.3	38.6	38.6
Rwanda	—	—	8.1	8.3	8.6	8.8	9.1	9.3	9.8	10.1	10.4
East Africa			105.8	108.9	112.2	115.7	118.8	122.5	126.5	129.5	133.1

Source East African community statistics portal

Table 2.5 Mid year population density (persons per square kilometer)

Partner state/years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Burundi	239.4	246.0	252.6	259.1	265.3	271.7	278.2	285.7	289.3	296.3	303.4
Tanzania	37.1	38.2	39.0	39.8	41.0	42.0	43.0	45.0	45.5	47	47.4
Uganda	115.8	119.6	23.0	127.5	131.7	135.9	138.3	143.0	148.1	153.5	159.1
Kenya	52.3	53.9	55.4	57.2	58.9	60.4	62.2	64.0	67.3	67.6	67.6
Rwanda	—	—	321.0	329.7	338.6	347.8	357.3	368.0	373.2	383.9	395.9
East Africa			61.7	63.4	65.4	67.4	69.1	71.1	73.7	75.5	77.6

Source East African community statistics portal

density per square kilometer, making the cost of marketing and access costs to be lower than in a dominantly rural scenario with villages scattered unevenly over geographical space.

2.9 Growth in MVA and GDP Correlation

Manufacturing value added (MVA) can only grow when new productive technologies are deployed in processing of raw materials and agricultural products. When growth in MVA happens, we can expect also a positive upward movement in the rate of GDP. Simply stated, there is a positive correlation between growth in MVA and GDP growth.

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