Agricultural Sector Development and Structural Transformation: Sub-Saharan Africa versus East Asia

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Agricultural Sector Development and Structural Transformation: Sub-Saharan Africa versus East Asia

This paper has revisited the roles of agricultural sector development for traditional economies in Sub-Saharan Africa (SSA) in responding to the twofold challenges – broadening the base of economic growth and sustaining growth momentum. Based on a holistic and long-term perspective on the mechanism of an economic take-off and a realistic characterization of the initial conditions of SSA economies including their crucial dependence on ‘communal ownership of land,’ this paper proposes a two-transition approach to a traditional agriculture-based economy’s take-off, where agricultural development in the current generation precedes and prepares for industrial development in the next generation.

The results from the empirical analyses using regional and country data have confirmed the following hypotheses derived from the framework: First, that it is agricultural development that generates positive external effects on industrial development, and not *vice versa*. Second, that a primitive economy evolves to higher stages through agricultural and industrial developments in a sequence with the demographic dividend and savings accumulated in the phase of agricultural development being indispensable for the economy’s transition to industrial development.

Keywords: structural development, agricultural sector development, demographic dividend, stages of economic development

JEL Classification: O1, O4

I. Introduction

The challenges facing Sub-Saharan African economies for development are two-fold – broadening the base of economic growth and sustaining the growth momentum in the long term. The narrowness of their growth base reflects multifaceted impediments to *contemporaneous interactions* of agents and sectors with each other. The long-term trend of economic stagnation implies existence of some underlying forces that hamper the *inter-temporal resource allocation* necessary for economic take-off.

In a sense, the narrow growth base and unsustainability of growth are two sides of the same coin. To see this, let us consider the recent faster growth of the African economy. The last decade witnessed Africa's economy grow at an unprecedented pace of 5 percent per annum, well above the global norm. However, it is highly uncertain whether the growth momentum will be sustained as the sources of that growth are largely concentrated on the commodity sector. In particular, Africa's recent high growth depended heavily on exports of mining resources, with 90 percent of African trade taking place between Africa and the rest of the world.¹⁾ Moreover, very little of this high growth has been translated into social development.

The entanglement of social and economic underdevelopment in SSA makes the designing of the policies to initiate broad-based and sustained economic growth a very elusive matter. In-depth understanding of both the nature of the economic stagnation in SSA and the mechanism of a traditional economy's transition to self-sustaining growth might empower the devising of a key to the solution.

To find out the right clue to addressing the challenges of Sub-Saharan African economies, it is essential to take a holistic and long-term perspective; the take-off of a traditional agriculture-based economy involves structural transformations in both the society and the economy, besides which, the interaction between social development and economic development takes a long time period. Indeed, episodes of sustained rapid growth in economic history usually ensue from a series of structural transformations in different sectors in different time periods often by taking turns. In general, a stylized pattern of this kind may reflect the constraint that an economy

1) Mthuli Ncube, cited in David Smith, Africa's Growing Ambition pp. 48-51, *Portfolio*, Issue 77, May 2012.

needs to have social capabilities to respond to economic opportunities in a specific sector in excess of a threshold as expounded by Azariades and Drazen (1990), Temple *et al.* (1998), and others.

A holistic approach to understanding the nature of economic stagnation entails discussion of the technological complementarity among factors. To the extent that productive factors are mutually complementary to each other, the poor quality of one factor, e.g., labor, prevents other factors, e.g., capital, from increasing. A non-exhaustive list of the factors reinforcing each other in weighing down on the SSA economy also includes; pre-modern institutions and infrastructure, the weakness of integration into the global economy, low agricultural productivity, malfunctioning of market institutions, underinvestment in human and physical capital, the conservation of smallholders in clinging to traditional technologies, shortages of employable labor supply. These underdeveloped economic factors underlie the weak linkages from exports to domestic sectors and the widespread poverty in SSA. According to African Development Bank data, the share in the total population of people living on less than 2 dollars a day still exceeds 70 percent. The high incidence of poverty among the majority population in return has negative influences on the development of productive factors. With subsistence levels of income, the majority of people can hardly improve their health to the adequate level required for industrial work. The poor in SSA also opt to give birth to as many children as possible, which, combined with extreme poverty, results in high incidence of child mortality, malnutrition and stunting of children. The poor health, short life expectancy, and extremely high age dependency – the ratio of the dependent age population to the working age population – continue to exert negative influences on economic development. Poverty under a dual economic structure perpetuates itself over generations because it stalls the improvement in health and life expectancy of the next generation.

A long-term perspective is often missing in the discussion of the mechanism of a traditional economy's transition to self-sustained growth. The usual practice in development economics (e.g., Spence 2008) in taking stock of country experiences in economic development is to focus only on the success stories, especially on the period during which an emerging economy recorded rapid growth. This approach is justified only if the rapid growth is not conditioned by a prior success in structural transformation, or equivalently if the economy has not inherited widespread pov-

erty, putting downward pressure on human and physical capital development.

Application of a long-term perspective to empirical research on the mechanism of structural transformation is hampered by the paucity of long-term data covering a number of different phases of economic development. According to the extremely long-term data on GDP per capita compiled by Maddison (2003), Africa's GDP per capita in 2001 (USD 1,489) remained more similar to that of the pre-industrial U.K. in 1700 (USD 1,250) than to that of China in 2001 (USD 3,583). Accordingly, the experience of Korea that is more relevant to the present day SSA countries' economic development is that during the first fifty years from the early 1910s when it began reform of agriculture-related institutions rather than the second fifty years from 1960 when it began industrialization. Nevertheless, most contemporary researchers including Spence (2008) draw lessons from Korea using data starting from 1950 or 1960. Probably, they were unable to develop and apply a long-term perspective partly due to limitation of data availability and partly due to their distraction to the '*miraculous growth*' recorded by the country's economy during the latter period.

Not surprisingly, both the literature and policy makers are torn between supporting the strategy of 'leap-frogging to industrial development' and that of 'agriculture-first.' For example, at the African Economic Conference held in Tunis in October, 2010, two prominent speakers expressed opposite views. Mr. Sanusi, Governor of the Central Bank of Nigeria, argued for industrialization in Africa along the value chains of agriculture. In contrast, Mr. Fan, Director General of the International Food Policy Research Institute (IFPRI), urged African leaders to focus on investing in agriculture first for achieving food security before embarking on the strategy of industrialization. Development institutions have yet to agree with respect to this issue as well. The World Development Report 2008 (WDR 2008, World Bank 2007) has argued that "the case for using the powers of agriculture for poverty reduction and as an engine of growth for the agriculture-based countries is still very much alive today (p. 64)." On the other hand, UNCTAD (2010) has urged the Least Developed Countries in Africa to implement industrial policy so as to benefit from the liberalization of trade and finance.

In order to fill these gaps in the literature and the practices, this paper takes a holistic approach and proposes a conceptual framework, namely, *a two-transition approach to an economic take-off*. The testable hypotheses derived from the approach include: First, that it is agricultural development that generates positive external ef-

fects on industrial development, and not *vice versa*. Second, that there are stages of economic development with two transitions – agricultural sector development and industrial development – in a sequence. Third, that the demographic dividend and savings accumulated in the phase of agricultural development are essential for an economy's transition to industrial development and thus to sustained growth.

The organization of this paper is as follows. Section 2 critically reviews the related literature. Section 3 discusses the nature of the initial conditions for economic development of SSA and then presents the two-transition approach to an economic take-off. It also discusses the policy choices available for agricultural sector development in SSA. Section 4 performs empirical analyses of the hypotheses derived from the discussions on the dynamics of growth and structural transformation. Section 5 concludes.

II. Literature Survey

1. Agriculture versus industry

A prominent feature emerging from reviews of the debates on 'agriculture versus industry' as an instrument for structural transformation of a traditional economy is the prevalent skepticism about the role of agriculture in creating the momentum for self-sustained economic growth. The agriculture pessimism is deeply rooted in the belief that industry is innately more productive than agriculture while linkages of industry to other sectors are stronger than those of agriculture as noted, among others, by Hirschman (1958).

In putting the argument into practice, this line of the literature usually neglected to check whether the preconditions to make industrialization feasible are met. Although the Lewis (1954)' dual economy model could explain the structural transformation of East Asian countries well, it does not mean that the case for industrialization through taxation of agriculture²⁾ obtains in SSA too. The pro-industry

2) This policy is referred as 'inward-looking' industrialization as opposed to 'outward-looking' industrialization.

argument relied critically on the assumption of '*unlimited supplies of labor*' in the traditional agricultural sector. This was not the case for SSA in the 1960s and 1970s when many SSA countries implemented an import-substitution industrialization policy; although populous, the SSA countries did not have '*unlimited supplies of employable labor*,' as the majority population living into subsistence economies were mostly unqualified for employment. This literature should have asked how the '*unlimited supplies of labor*' in East Asia in the 1950s could have come into existence.

This issue has been addressed by Jorgenson (1961), who demonstrated the need for agricultural productivity to reach a threshold for a traditional economy to have a critical mass of labor supply for industry. That is, in order for the economy to be able to launch and sustain industrialization, there needs to be a sufficient supply of food to feed the workers migrating from agriculture to work in industry. Another reason for the need of prior development of the agricultural sector is its role for broadening the domestic demand base for industrial products.

This agriculture-first argument was countered by Myint (1975), who pointed out the possibility of developing economies' importing cheap foods from abroad, thereby denying the necessity of developing domestic agriculture before starting industrialization. There was a missing point however; importing foodstuffs may deprive the indigenous people of the opportunities to develop their own agriculture and thereby the supply of employable labor; it may be more detrimental to the majority smallholder farmers and their children than encouraging industry as long as agricultural products are much less tradable than is necessary for the indigenous people to benefit from international trade in such an environment.

The disagreement between the pro-industry and agriculture-first advocates can be highlighted by their different interpretations of the *law of declining relative importance of agriculture* – that as an economy grows the shares of agriculture in production and employment decline. The pro-industry advocates attribute the law to the superior productivity of industry and use it to justify the policies of subsidizing industry at the expense of agriculture while the agriculture-first advocates ascribe it to the success of agricultural development, arguing that, unless a threshold agricultural productivity is reached, the relative decline of agriculture cannot begin.

In contrast to development theorists, economic historians mostly agree on the role of agricultural productivity as indispensable for industrial development. Rostow (1960) introduced an interim stage, called '*preconditions to take-off*,' between the

traditional economy and the take-off stage. He recognized the role of the commercial development of agriculture in the preconditions stage, while assuming the existence of foreign markets for agricultural produce. Kuznets (1967) demonstrated that the onset of industrialization in advanced countries had almost always been linked with agricultural development. Kang, *et al.* (1999) showed that, contrary to the prevailing view of Korean development, Korea had been able to industrialize during the period since 1960 thanks to the prior investment and corresponding productivity gains in the agricultural sector during the colonial period from 1910 to 1945.

Timmer (1988) synthesized the debate with four phases of agricultural transformation, in which the role of agriculture is redefined as the economy evolves.³⁾ In the first Mosher phase, agriculture requires inputs, institutional changes, and the adoption of new technologies in order for agricultural development to get started; however, the necessity of investment in agricultural development could be bypassed by a “jump strategy.”

In the second, Johnston-Mellor phase, agriculture contributes to growth while the share of agriculture in employment starts to decrease. Simultaneous efforts are taken to promote agricultural and industrial development in consideration of the close relationship between agricultural transformation and industrial technological progress. This framework, however, fails to consider the positive external effects of the transition from extensive to intensive agriculture and the negative external effects arising from the choices of high human fertility.

Shortcomings common to all of the above theories include, first, that they have ignored the role of the micro-foundations, especially *institutions*, needed for economic transition. For example, Rostow ignored the importance of property rights in motivating individuals’ decisions to take risks. Second, that they disregarded the long-term *inter-generational* impacts of agricultural development on the development of employable labor supply. Although an FAO report (Sakuyama, 2007) recognized the agricultural sector’s role in providing surplus labor, it did not consider the possibility that this role is realized through inter-generational transfers rather

3) Discussions of the third Schultz-Ruttan phase and fourth Johnson phase of agricultural transformation are omitted here, because they are less relevant.

than through markets. Even WDR2008 did not elaborate on this issue; although WDR2008 highlighted agriculture as an engine for economic development in a certain *type* of country – an agriculture-based developing economy – it did not demonstrate agricultural development to be the *only pathway* through which an agriculture-based developing economy can make transition to an economic take-off.

2. The demographic dividend, agriculture, and institutions

Some neoclassical economists like Matsuyama (1992) regarded agriculture as competing with industry for limited resources, especially for labor. Matsuyama argued that an initially low (high) level of agricultural productivity in Japan (Argentina) has helped (hampered) the transfer of labor from agriculture to industry, which explains the success (failure) of Japan (Argentina) in industrialization. The main rationale is that industry has strong learning-by-doing effects while agriculture does not.

However, this argument neglected the possibility of a demographic channel of agriculture's contribution to the initiation of economic development. Without the demographic dividend to be generated by agricultural development, the efforts to develop industry would not be feasible from the first place. Examples would include the “inward-looking industrialization” policies implemented by some SSA governments during the 1960s and 1970s, which largely failed over time.

The literature on the demographic channel of agriculture's contribution to economic development is less evolved, although there is some research on the interaction between population and technological progress and on the role of agriculture in generating demographic changes. In general, a rapidly growing population puts pressure on available resources including land. High and increasing *population density* puts people under pressure to adopt *intensive agriculture* (Boserup 1965). Similarly, Goodfriend and McDermott (1995) modelled the economic transition from a non-market to a market economy as being driven by population growth, which leads to the expansion of markets and opportunities for specialization. To model the long-term economic transition from a Malthusian to a Post-Malthusian economy, Galor and Weil (2000) assumed that an increase in population size causes technological progress. This assumption reflects the observation that higher population growth in

Western Europe until 1820 preceded higher growth in output per capita thereafter.

On the other hand, Heinsohn (2003) and others have found that high population growth may lead to social deterioration rather than technological progress; the *youth bulge* in the age structure of the population accompanying spurt-like population growth tends to lead to social unrest, war or terrorism. Conflicts and war may then lead to a decline in the rural population and an increase in the urban population (Mafusire, *et al.* 2011).

Empirical studies WDR2007 show that, "as the proportion of workers in the population rises or falls, so do opportunities for economic growth" In particular, a falling age dependency ratio, i.e., ratio of the number of dependents (people aged 0-15 and above 65) to that of working age people (aged 15-64) – a so-called 'demographic dividend' – provides a traditional economy with opportunities to start economic growth; the decline in age dependency ratio results firstly as the mortality rate begins to fall while the fertility rate remains constant, and secondly as the fertility rate also starts to fall with a lag; the demographic dividend usually lasts for about 40 years from the time of the appearance of a baby-boom generation. As the baby-boom generation grows up, it contributes to increases in the labor supply, savings, and human capital. In particular, a longer life expectancy fundamentally changes the way that people live – their attitudes to education, family, retirement, the role of women and work (Bloom, *et al.* 2003 p. 41).

Studies by Bloom and Sachs (1998) ascribed between one-fourth and two-fifths of East Asia's economic growth to this demographic dividend. Bloom, *et al.* (2003) found in contrast that, despite some declines in mortality rate in SSA the age dependency ratio there had not fallen; based on this observation they argued that "as long as fertility remains high and families have large numbers of children, SSA countries are unlikely to see rising incomes or healthier and better-educated workers (p. 65)."

In a similar vein, Fogel (1993) singled out the reduction in malnutrition as the main factor behind the first secular decline in mortality in Britain between 1725 and 1830. According to him, malnutrition during childhood has a long reach, predicting morbidity in adulthood. He showed in addition that increased caloric intake during childhood leads to increased body size which leads to less mortality and morbidity. According to Fogel, the resulting increases in dietary energy available for work and in human efficiency contribute substantially to economic growth. He also showed that the lag between the time when investment in public health is made and

when the benefits occur may be as long as a century.⁴⁾

As for the source of the demographic dividend in the U.K., the economic history paper by Timmer (2002) noted that, “until 1875, nearly all of the food that permitted the increases in nutrient intake in Britain was produced domestically, a result of the *agricultural revolution* in the late 18th century and early 19th century (p. 1502).” In fact, the first wave of secular *decline in mortality* in U.K. from 1725 to 1775 followed a decrease of the wheat price in England by 23 percent between the period from 1660 to 1669 and that from 1717 to 1724 (John 1965, p. 19). Put together, these observations imply that the agricultural development in the decades before 1725 contributed to the genesis of the demographic dividend in the U.K.

Timmer (2002) further argued the agricultural revolution as heavily stimulated by “the protection offered by the *Corn Laws* that existed from 1815 to 1846 (p. 1503).” That is, the protection led to heavy investments in new agricultural technology and rural infrastructure and through these, to agricultural productivity increases. He contrasted this to the experience of France at that time, which had a provisioning policy designed to keep food prices low; France was unable to increase agricultural productivity; besides, “imports were not sufficient to provide increases in caloric intake per capita especially in rural areas where three-quarters of the labor force lived and worked (p. 1503).”

The validity of this argument does not necessarily imply that a protective policy is itself sufficient for the commercial development of agriculture. As Acemoglu and Robinson (2011) have documented, without reforming the strongly inertial pre-modern institutions⁵⁾ and infrastructure, a traditional economy tends to be stuck in economic stagnancy. In the U.K., the private property rights to land, established long before the *Corn Laws* were enacted, had played an important role in agricultural development. The institution was strengthened by the enclosures of the com-

4) Fogel maintained that investments made as much as a century earlier contributed to an extension in life expectancy by four years during the period between 1929 and 1939, despite a continued high unemployment rate of above 16 percent.

5) “Institutions are the humanly devised constraints that structure human interactions. They are made up of formal constraints (rules, laws, constitutions), informal constraints (norms of behavior, conventions, and self-imposed codes of conduct), and their enforcement characteristics” (North, 1990). Institutions establish the payoff matrices for the counterparties and their choices of transactions. Under a specific institution, some actions get rewarded while others are penalized. Some institutions promote cooperation among individual while others do not.

mon lands, the expansion of which accelerated in the 15th and 16th centuries. Arguably, this contributed to increased investment in large-scale agriculture combined with international trade. It also contributed to the appearance of a landless working class. Private property was further protected at the constitution level by the 1688 *Glorious Revolution*. Private property rights provided a legal infrastructure for supporting commercial agriculture and investment in physical infrastructures. *Informal institutions* that effectively encouraged *gentlemanly behavior* among the bourgeois helped to finance investment in agriculture as well as industry (Mokyr 2007). The policies of mercantilism helped commercial development of agriculture by providing ample markets for British agriculture in the 17th century.

Comparison of the experiences of the U.K. and China in agricultural development leads us to infer that the order or timing between institutional reforms and infrastructure developments does not matter.⁶⁾ As explained above, institutional reforms preceded development of infrastructure for agriculture in the U.K. In China, in contrast, supplies of infrastructure preceded the establishment of private ownership of agricultural products or land. The communist movement emphasized provision of *physical infrastructure* such as roads and electricity which could be used for both agriculture and industry. These improvements in infrastructure supported the initial agricultural development, which led to a fall in mortality rates. It was not until 1978 that regulation of land use and agriculture allowed some sort of *private ownership*.

III. Agricultural Sector Development and Structural Transformation for SSA

1. The initial conditions of economic stagnation

At the risk of oversimplification, a typical SSA economy is characterized as being partly modern and partly traditional, with the majority of the population being engaged in subsistence agriculture in rural areas. The core *institution* governing the traditional

6) *Infrastructure* 'facilitates market transactions or makes other economic inputs more productive (Jimenez 1995)' as do proper institutions.

economy is the *communal ownership of land* (AU, AfDB, and UNECA, 2010).⁷⁾ Under the informal customary rule sets, village lands are controlled by farmers' associations or committees. The representatives – e.g. paramount chiefs in Sierra Leone, presidents of registered villages in Tanzania, etc. – undertake the roles of land custodians. Although smallholder farmers have access to land, only a few have title to the land. In some cases they are unsure whether they can keep tenure in the following year or whether they can recoup the returns from their own investments in the land. They may have to yield land to other members in the next year even if they have made investments in the land by installing irrigation or inputting fertilizer. They would thus rather extract as much from the land as possible despite its consequent degradation and depletion. In West Africa, for example, smallholders may move deeper into forests to clear land for “slash and burn” farming upon depletion of the land, accelerating deforestation.

Due to these customary land institutions, land is not available as a means for accumulating wealth by smallholder farmers. Even where land tenure is secured, land is not an asset that is readily bought or sold. Without a cadastral survey, and with registration costs being high, registration of land is seldom done. Smallholders cannot use land as collateral for obtaining credit. Partly due to this, and partly due to financial illiteracy, high fees, and documentation requirements, *finance* remains underdeveloped (Salami, *et al.* 2010). Credit is not available to those who have no legal land titles to use as collateral for borrowing, except when small amounts of credit are extended to families with sufficient young and healthy male workers.

With finance and land being unavailable for wealth accumulation, smallholder farm households use their *children* as the *means of savings* (Azariades and Drazen 1993). Smallholders choose to have as many children as possible, in the hope that the surviving children will support their parents' in their old age. The private rate of return from having another child is higher than that of the social return, meaning an additional child has *negative external effects*. With high human fertility, the population grows rapidly, amplifying the negative external effects and weighing heavily on public safety nets. The average family size is large. The young-age dependency ratio is kept high. According to

7) According to the EU (2004), in Eastern and Southern Africa, land ownership is featured by large-scale alienation of land by those associated with the former colonial powers, by commercial farmers, and by national parks while land ownership in West Africa is characterized by limited white settlement and the continued strength of customary powers, overlaid by sequences of legal, political and institutional changes.

World Development Indicators, the share of the population under age 15 exceeds 40 percent of the total. Moreover, the ratio of the dependent to the working-age population has until recently never been lower than 80 percent. To the extent that bearing and rearing children takes time and energy, the high age dependency ratio demobilizes workers, lowering the productivity of the current generation's labor and reducing the average quality of the future generation's labor too. The private benefit of larger family size is eroded as the family size increases above a certain limit. Where it generates a *youth bulge* in the population and when income per capita is limited by the low productivity of agriculture, the private as well as the social benefits of additional babies become negative.

Another factor preventing farmers from adopting intensive agriculture is lack of infrastructure. *Infrastructure* to connect the rural communities located in sparsely populated areas to the outside world is poorly developed, although cities located along the coast lines are closely integrated with the global economy. The economy is on the whole highly *fractionalized*, not only because of ethnic, linguistic and religious factors but also due to the underdevelopment of infrastructure. That is, the formal and informal sectors as well as the urban and rural areas are not well integrated, as poor supply of roads, electricity and communications keeps transaction costs high. Thus, not only the lack of incentives to invest in the land but also insufficient water and roads restrain individuals from choosing extensive agriculture. Under extensive farming, *specialization* can hardly be expanded beyond the farm households.

The pre-modern land institution, underdeveloped infrastructure, and high age dependency reinforce each other to lock the economy in extensive agriculture with an extremely low level of productivity. According to the World Agroforestry Center (2009), "cereal yields in Africa average about 1 tonne per hectare, compared to average cereal yields of 2.5 tonnes in South Asia and 4.5 tonnes in East Asia." Due to the low productivity of extensive agriculture, farm households' income stays at subsistence level. Without adequate incomes to support development of their children, it is likely that parents see babies perishing early in their lives and, even when they survive, malnutrition hampers their growth into healthy and strong workers. Hereby, the supply of *employable labor* does not expand in the next generation even despite rapid population growth.

Under these circumstances, the new generation has little choice but to repeat the traditional ways of doing business. With many children to feed and lacking other means of savings, new smallholders voluntarily stick to the old regime of the 'commu-

nal ownership of land,' because it allows free access to land which usually assures them of a subsistence level of income. Therefore, any movements to change the status quo are stalled.

2. A two-transition approach to economic take-off

The strands of literature reviewed above do not by themselves enable us to answer the question of how to move the people in SSA out of a vicious circle between communal ownership of land, extensive agriculture, large family size, low income, and rapid growth of dependent population. The literature on the role of agriculture in preparing an economy for industrialization (e.g., Jorgenson 1961) does not consider the impact of agriculture on savings. In fact, the savings channel of agriculture's contribution to the initiation of economic development has seldom been rigorously addressed in the economic development literature. Even, the scope of the phase theory by Timmer (1988) is limited to sector development via agricultural transformation and thus misses much of the broader dimensions of an economy's evolution. Moreover, the literature on endogenous evolution of economic stages (Goodfriend and McDermott 1995, Galor and Weil 2000) have failed to incorporate the contexts of SSA in their models as they have presumed the existence of market institutions from the start, which is not necessarily the case in SSA.

To fill these gaps, the authors of the paper propose to synthesize the building blocks into a big picture – what may be called a *two-generation two-transition approach to a traditional economy's take-off* or, a *two-transition approach for short*. In moving the economy out of the *vicious circle*, the approach focuses on what the countries in SSA have in plenty – land – rather than on what they do not have enough of – physical and financial capital, infrastructure and modern technology – and attempts to figure out how to motivate and empower the people there.

Initially, the majority of people live on smallholder farming under communal ownership of land and the economy is in a Malthusian stagnation in that any productivity growth is consumed up by population growth. The smallholder farmers have subsistence agriculture-specific skills, hence being unable to move to the industrial sector. Having a short lifespan and burdened with the duty to support a number of children, they can hardly develop their own human capital to be suitable for industrial work.

The communal ownership of land deters the development of markets including financial markets. Deprived of property rights, people choose high human fertility to save agricultural surpluses and to prepare for uncertain incomes in their old ages by having children. With insufficient income from extensive agriculture, their choice of high human fertility leads to the physiological underdevelopment and high mortality of the next generation, keeping young adults from developing higher skills. Hence, the demographic features and economic structures of the first generation are reproduced in the next generation too.

The two-transition approach posits that the structural transformation of a primitive economy takes two steps – *broad-based agricultural sector development* followed by *industrial sector development*. Industrial development requires prior development of a demographic dividend, which is missing. Meanwhile, the majority of people in the first generation live in rural areas, relying on agriculture for their livelihood. The traditional economy is usually richly endowed with land suitable for agriculture. Hence, *broad-based agricultural development* may be the only way out.

Agricultural development is referred as ‘broad-based’ in two senses. First, the benefits are broadly shared by the next and current generations engaged in various sectors. Second, the domestic economy is integrated under the market system based on private property. Broad-based agricultural sector development in a traditional economy requires above all reform of the ‘communal ownership of land’ to private ownership of land or to Chinese-style agricultural incentive schemes so that the tillers may have strong incentives to make investments in the land.⁸⁾ It also requires the land reform to be as equitable as possible so that the surpluses are broadly shared among people and over generations. In addition, it requires investment in infrastructure to reduce the transaction costs related to commercial agriculture. Lastly, it requires a switch from extensive to intensive agriculture and hereby an increase in agricultural productivity large enough to allow financial savings.

Setting aside the issue of how to carry out the required institutional and land reforms, the reforms, once done, they will strengthen the incentives for individual farmers to make investments in land. The more evenly the land is redistributed among

8) Acemoglu and Robinson (2011) maintain that extractive institutions characterized by a lack of law and order and insecure property rights need to be transformed into inclusive institutions characterized by secure property rights, law and order, markets, and state support for markets.

smallholders, the stronger will be the incentive effects at the aggregate level. Insofar as their ownership of land makes finance available to the owners, owner-tiller farmers will be better positioned to make investments in land. With these improved conditions, farmers will be able as well as be willing to switch from extensive to intensive agriculture. Public provision of infrastructure will accelerate agricultural intensification. Productivity in agriculture will increase to generate economic surpluses.

Individual households' allocation of the agricultural surpluses among competing activities – self-consumption, rearing children, and financial savings – determines the extent to which the momentum generated by agricultural development spills over to the rest of the economy over time. First, the agricultural surplus can be used to nourish and educate their children. The increased caloric-intake by children lowers the childhood mortality rate. With the fertility rate remaining constant, the falling mortality implies a genesis of a demographic dividend or a baby-boom generation. Second, as farm households switch out of extensive agriculture, they may also change the means of saving from 'children' to financial savings. These savings may be channeled to investments in land, agricultural infrastructure and other projects.

Effectiveness of the channeling of savings to investment depends critically on the extent of financial deepening. The two-transition approach presumes agricultural development to be a precondition for financial liberalization; without agricultural development, financial liberalization would fail to deepen financial markets;⁹⁾ in an agriculture-based economy, the savings will not be sensitive to changes in real interest rates unless agricultural productivity is high enough to allow people to deposit surpluses in banks.

Anecdotal evidence for this presumption can be found from the experiences of Korean and Kenyan interest rate deregulation. The 1965 interest rate liberalization in Korea raised real interest rate on long-term bank deposits, from a negative level of -17% in 1964 to a positive 11.2% in 1965 (Aghion, *et al.* 2009). Subsequently, savings picked up, from a level of 12.0 % of GDP over the five years before the reform to a level of 17.0% of GDP thereafter. Besides this, despite the hikes in interest rate, investment

9) This presumption contrasts to the McKinnon (1973)-Shaw (1973) hypothesis that interest rate liberalization is a sufficient condition to deepen financial markets and thereby facilitating industrial development. This view neglects the essentiality of agricultural development to strengthen the nexus between finance and economic growth in traditional developing economies.

climbed from 12.8% of GDP to 21.6% of GDP over the same period (source: National Accounts of Korea). In contrast, Kenya's similar interest rate deregulation was not followed by an increase in domestic savings (Kariuki 1994).¹⁰⁾

Obviously, the prior development of the agricultural sector in Korea must have helped the financial reform in Korea to succeed; rice yield per hectare in Korea had increased from a little above 1 tonne in 1910s to more than 3 tonnes in the 1960s (Kim 2010), which meant the generation of substantial economic surpluses. The economic surpluses led the genesis of the 'unlimited labor supply' as the majority of farmers could feed and educate their children from increased incomes. Once agricultural development had made the demographic dividend and domestic savings available for the economy, labor-intensive industries could start, employing the numerous healthy second-generation workers. This stands in stark contrast to the case of Kenya's financial reform; the lack of comparable agricultural development in Kenya in the period before the reform explains much of the failure.

3. Policy choices for agricultural development

The above discussion makes it obvious that the key to the structural transformation in a typical SSA economy is intensification of agriculture. There are two policy choices to achieve this.

On the one hand, the government may pursue a policy of developing *large-scale commercial agriculture*, which refers to agricultural intensification based on large-scale organization of land and infrastructure for commerce. Through opening the economy to international trade and investment, the government can help the economy to obtain international competitiveness in commercial agriculture. The policy facilitates agriculture's benefit from economies of scale through the increased size of farm operations and increased adoption of more advanced agricultural technologies.

However, it is unlikely to generate positive spillovers on human capital stock large enough to create a demographic dividend. Large-scale intensive farming allows only a

10) The savings channel of agricultural development to the economy provides us with another reason for putting agricultural development before industrial development. However, a rigorous empirical analysis of this channel is beyond the scope of this paper.

small number of landlords to enjoy high profits, while creating relatively few jobs and low incomes for farm workers. With little trickling down of the agricultural surpluses, the rest of the population may be left out, to carry on with subsistence farming for a prolonged period. This implies that this policy blocks the economy from the demographic channel of agriculture's contribution to economic development.

On the other hand, the government may adopt an alternative policy – a *broad-based agricultural sector development strategy*. This policy targets at intensifying agriculture, integrating domestic markets through establishment of institutional as well as physical infrastructure, and attracting broad participation of small landowner farmers in agricultural sector development with equitable distribution of landownership. To establish institutional infrastructure for markets takes more than just the elimination of price controls. The dismantling of agricultural marketing boards during the 1980s and 1990s did not lead to emergence of market institutions in SSA. The success story of agricultural sector development in Korea starts with Koreans undergoing the politically painful process of establishing *de facto* as well as *de jure* private property in land during the colonial era. The process involved first, the cadastral surveys in the early 1910s; second, the investments in agriculture and building infrastructure such as water reservoirs and roads during the 1920s and 1930s; third, the land reform to establish ownership of land by tillers in 1949/50. Similarly, the success story of China started with the government's implementing agrarian reforms during the 1920s, the 1930s, and the 1940s, while building roads and other agricultural infrastructure simultaneously. Then they could benefit from increases in agricultural productivity.

Establishment of private property rights in land can motivate and facilitate individuals in specializing, risk-taking, saving, and innovating. For example, the '*land-to-the-tiller*' reforms in East Asia especially that of South Korea in 1949/50 brought about immediate increases in agricultural surpluses and farm households' income. According to Mason, *et al.* (1980), South Korean land reform resulted in an increase in the share of owner-tillers from 16.5% of total farmers in 1947 to 73.6% in 1960 (p. 427). The agricultural incomes of farm households also increased by 80% in real terms over the years from the 1930s to 1975, with half of this increase owing to productivity growth and the other half to new ownership following land reform. The productivity growth resulted partly as the equitable distribution of land facilitated the rapid diffusion of new agricultural technologies among farmers; technology diffusion was accelerated after the '*land-to-the-tiller*' reform in 1949/50, as the farmers, whose land holding were largely

of uniform size, emulated those neighbors who adopted new technologies very quickly (Mason, *et al.* 1980, p. 226).

The equitable distribution of land likely leads to an even distribution of agricultural income among farm households. Consequently, the children of farmers are able to be quite equally well-nourished and thus infant mortality rates will start to fall. This leads to the genesis of the demographic dividend, a key to enable an economy to industrialize.

There is a counter-argument, however, that ownership of land is not a binding constraint on farmers in SSA where land is not valued as an asset. Matchaya (2010) has found no significant effects of land ownership on investments and output efficiency in Malawi, from analysis of survey data for rural Malawi. This insignificance of land ownership as a determinant of investment may reflect the lack of complementary factors to make landownership matter. The missing factors e.g., poor development of legal institutions would keep transaction costs too high for the land markets to work. Insofar as title to land does not bring additional value to the owner compared to that to the leaseholder, an owner will not make any more investment in the land than a leaseholder would. But this does not necessarily preclude the possibility that landownership matters under other circumstances, when the transaction costs are low enough.

To facilitate small land owners to realize scale economies, the government may encourage farmers to establish agricultural cooperatives and cooperate in procurement, financing, and marketing as well as in production. The Korean experience has it that agricultural cooperatives can play important roles in marketing products, providing farm inputs and consumer goods, credit and banking, insurance, warehousing, transportation and other social and cultural activities.

In promoting a switch from extensive to intensive farming, the government may also think about *land zoning* for broad-based agricultural development. Land zones equipped with proper connections to infrastructure for agriculture would enable farmers to engage in intensive agriculture. Land ownership in the zones would be more valuable as collateral for bank credit. The value of land would reflect both its agricultural productivity and its value as an asset. Under the communal ownership of land, land is under-valued because of its low productivity. Currently, the costs of land zoning, apart from its political costs, are likely to be low because of the fact that the land is still under-valued. Once land zones are provided with agricultural infrastructure, then expectations of development gains would accelerate the adoption of intensive agriculture.

IV. Empirical Analysis

1. Testable hypotheses

We perform pilot tests of some aspects of the *two-transition approach to an economic take-off*. The first three hypotheses pertain to individual building blocks and the last hypothesis to a synthesis of the approach.

Hypothesis 1: (*Role of agriculture in demographic change*) Agricultural development creates conditions for the genesis of a demographic dividend.

Hypothesis 2: (*Causal role of agriculture*) It is agricultural development that generates positive external effects on industrial development, and not *vice versa*. Accordingly, a success in agricultural sector development rather than industrial development triggers its own decline in terms of the relative importance in the economy.

Hypothesis 3: (*Getting agriculture moving*) In order to get agriculture moving, investments in the institutional and physical infrastructure for agriculture are required.

Hypothesis 4: (*Stages of economic development and their drivers*) There are various stages of economic development. In a primitive economy, (extensive) agriculture's inability to create a demographic dividend perpetuates economic stagnation. It is widespread agricultural productivity growth that enables a primitive economy to generate a demographic dividend while it is the demographic dividend and savings that drive the economy's transition to industrial development.¹¹⁾

11) The increase in economic productivity due to movement of resources from a sector with low productivity to another with high productivity is called the *Syrquin (1986) effect*.

2. Evidence from time-series data of the EAP and SSA regions

A set of data from the *World Development Indicators* of the World Bank provides us with clues to trace the whole process of an economy's take-off. By contrasting the time series data of the East Asia and Pacific (EAP) region against those of SSA region from 1960 to 2010, we have found the following pattern: the GDP per capita in the EAP region had risen from levels lower than that of SSA in the 1960s, 70s and 80s, and surpassed it by the early 1990s; the former has continued to rise since then, while the latter has stayed below the level it reached during the 1970s, as shown in Figure 1a.¹²⁾

This contrasting pattern of growth implies the existence of at least two different stages of economic development – a stagnant economy and an economy in take-off, with the SSA being in economic stagnation although the latest upward movement of GDP per capita requires some reservation of a final judgment. This in a sense attests to *Hypothesis 4*.

12) All the data are from the *World Development Indicators* 2011 of the World Bank.

Figure 1. Economic Indicators

Data: *World Development Indicators*, The World Bank.

Regarding *Hypothesis 1* on the role of agriculture in demographic change and *Hypothesis 2* on precedence of agricultural development to industrial development, the sequence of structural changes provides us with some stylized facts: First, a rising share of value added in agriculture in the early 1960s was followed by its own decline thereafter as shown in Figure 1b and an increase in the rate of population growth in the late 1960s as shown in Figure 1c. The 1960s was also characterized by a steeply falling mortality rate as shown in Figure 2a, a sharp rise in life expectancy, which picked up from around 45 years in 1960 to around 65 in 1970, as shown in Figure 2b¹³⁾, a persistently high age dependency ratio till the mid-1970s as shown

13) The life expectancy in the EAP region tracks that in China as shown in Figure 2b.

in Figure 2c, an increasing rural population as in Figure 2d¹⁴⁾, and a stable share of urban population as shown in Figure 2e. These structural changes in demography during the 1960s happened despite of the low ratios of gross capital formation to GDP during the period.

Figure 2. Demographic Indicators

Data: World Development Indicators, The World Bank.

14) The size and trend of the rural population in the EAP region seem to be dominated by China as shown in Figure 2d.

Second, the persistently high age dependency ratio in the 1960s was followed by a declining age dependency ratio in the 1970s as in Figure 2c. The mortality rate, which had fallen substantially in the former decade, continued to decrease as shown in Figure 2a. The high and stable human fertility rates in the 1960s decreased sharply in the 1970s, as shown in Figure 2f. The fall in mortality in the 1960s preceded the decrease in the fertility rate in the 1970s, contributing to the genesis of the demographic dividend in the 1970s. The increased share of the working age population in the EAP region during the 1970s was not due to population policy either. In the case of China, the government's 'one-child policy' was implemented in 1979 after the appearance of the demographic dividend by the mid-1970s.

Third, the rapid increase in the working age population since the mid-1970s as shown in Figure 2c, the sharp increase in investment rates since 1970 as shown in Figure 1d and the stable urbanization rate during most of the 1970s as well as the 1960s as shown in Figure 2e together imply that the demographic changes during the 1960s and 1970s took place predominantly in rural areas. The rural-agricultural during the 1960s and the first half of the 1970s, which had such broad-based impacts on demography, could provide a shelter for youths awaiting employment. The *broad-based agricultural development* was essential in abating the risk that the 'youth bulge' in the population structure could impinge on socio-political stability as well as in generating a large pool of 'cheap labor' employable in industry.

Fourth, from the 1980s on, the decline in the age dependency ratio in the EAP region continued and was accompanied by acceleration in the growth of GDP per capita. The trend of an ever-falling poverty rate in the region since 1980, as shown in Figure 3a, implied that it was the *broad-based agricultural development* in the previous decades that made the industrial development and urbanization from the late 1970s possible.

Last, the structural features in the SSA region have shown symptoms of a traditional economy in stagnation. The relative importance of agriculture in output and the demographic structure, especially the age dependency ratio, have seen little change, with only a few exceptions since 1960 when the data began. The rate of population growth reached 3% by 1967, and then remained at that level until 2004 when it declined to 2%, still much higher than that of the EAP region. Even the gradual decline in the fertility rate shown in Figure 2f reflects not so much a broad-based agricultural development as urbanization without agricultural development.

Meanwhile, the share of the population living in the largest cities in the SSA region had risen until 1990 as indicated in Figure 3b, attesting to the view that the urbanization there has resulted from rural people's flight to the cities during civil wars. Such urbanization without the preceding development of rural-agricultural areas reflects that people there are likely to be in a vicious circle between extensive agriculture, large family size, low income, and rapid growth of dependent population, the 'youth bulge,' and socio-political instability.

Figure 3. Social Development and Agricultural Input Indicators

Data: World Development Indicators, The World Bank.

The sequences of structural changes in the EAP region and the structural features of the SSA region together support at least partly *Hypotheses 1* and *2*. That is, agricultural development generates a demographic dividend and thus creates conditions conducive to industrial development; moreover, without it, industrial development is not feasible.

Evidence in support of *Hypothesis 3* is provided by the rapid and slow increases in agricultural mechanization during the 1960s as shown in Figure 3c and the increases and non-increases in the shares of agricultural land in the EAP and SSA regions, respectively, as shown in Figure 3d.

Until the mid-1970s, the EAP region had less agricultural mechanization and agricultural land than the SSA region. Then the EAP region caught up with the SSA region in terms of agricultural inputs by the 1970s. The catch-up of the SSA region by the EAP region in the agricultural inputs in the 1970s preceded that in the economic outputs in terms of GDP per capita in the early 1990 as shown in Figure 1a, confirming *Hypothesis 2* on the causal role of agricultural development in economic development and in part *Hypothesis 4* on stages of economic development and their drivers.

3. Evidence from international panel data

Despite being implicative, the time-series data do not provide sufficient information to make inference about *Hypotheses 4* on the stages of economic development and their drivers. Instead, this can be done using the international panel data with the developing countries being grouped by stage of economic development. To identify different stages of economic development, we group the total 102 developing countries into six samples; three sub-groups of low-income countries (LICs) in SSA, non-SSA and East Asia (EA), and three sub-groups of middle-income countries (MICs) in SSA, non-SSA and EA. Yearly data from the *World Development Indicators* are transformed into six non-overlapping three-year averages; from 1990-1992 to 2005-2007, making the dataset strongly balanced panel data.

The empirical model for examining the growth dynamics is an augmented neo-classical growth model, Model (1), with a dependent variable, GDP per capita of a country i $gdpp_{it}$. The explanatory variables are similar to those in Mankiw *et al.* (1992), as they include the ratio of domestic savings to GDP sy_{it} and the rate of population growth $gpop_{it}$ as a basis setup. The unique feature of the model is the vector of additional variables Z_{it} including agricultural value added per worker, $aggdp_{it}$, and the share of labor employed in agriculture, $empag_{it}$, and the young age dependency ratio, $depyoung_{it}$, rather than an index of education level.

$$gdpp_{it} = b_1^s + b_2^s gdpp_{it-1} + b_3^s gdpp_{it-2} + b_4^s sy_{it} + b_5^s gpop_{it} + b_6^s Z + \eta_i + \varphi_t + v_{it} \quad (1)$$

$$i = 1, \dots, N; t = 0, \dots, T, s = LIC_{SSA}, LIC_{Non-SSA}, LIC_{EA}, MIC_{SSA}, MIC_{Non-SSA}, MIC_{EA}$$

where GDP per capita is expressed at 2000 constant price in US Dollar terms, the subscripts i denotes a country and t denotes a three-year time period, and the superscript s indicates a stage of economic development.

Arellano-Bover (1995) linear system dynamic panel-data estimation has been employed to take the potential correlation between the lagged dependent variable and the unobserved panel-level effects into account. The method uses moment conditions based on time-differenced and level errors to correct the problem due to this potential correlation.

Table 1. Data summary – arithmetic averages

	Low-Income Countries						Middle-Income Countries					
	SSA		Non-SSA				SSA		Non-SSA			
					East Asia						East Asia	
	1990-07	2005-07	1990-07	2005-07	1990-07	2005-07	1990-07	2005-07	1990-07	2005-07	1990-07	2005-07
<i>gdpp_{it}</i>	2.35	2.38	2.50	2.59	2.51	2.68	3.01	3.06	3.23	3.34	3.06	3.19
<i>sy_{it}</i>	0.74	0.80	0.99	0.93	1.10	1.31	1.21	1.33	1.22	1.31	1.44	1.48
<i>gpop_{it}</i>	2.65	2.37	1.89	1.85	1.82	1.70	2.18	1.56	1.22	1.27	1.50	1.43
<i>aggdp_{it}</i>	2.28	2.31	2.50	2.53	2.51	2.56	2.78	2.83	3.22	3.30	2.76	2.83
<i>empag_{it}</i>	1.94	1.91	1.85	1.82	1.88	1.87	1.65	1.59	1.41	1.64	1.63	1.57
<i>depyoung_{it}</i>	1.94	1.93	1.84	1.80	1.81	1.75	1.87	1.82	1.70	1.62	1.69	1.61

Notes: *gdpp_{it}*, *sy_{it}*, *gpop_{it}*, *aggdp_{it}*, *empag_{it}*, and *depyoung_{it}* denote logarithmic values of the GDP per capita, the ratio of domestic savings to GDP, the rate of population growth, agricultural value added per worker, and the share of labor employed in agriculture, and the young age dependency ratio, respectively. All variables except population growth are in logarithmic values of ratios in percentages while population growth is in percentage.

Data: *World Development Indicators*, The World Bank.

Table 1 compares the averages of logarithmic ratios of the variables in model (1) for the six country groups. The low-income countries in SSA record not only low economic and agricultural productivities, but also low savings, high shares of labor employed in agriculture, high rates of population growth and high young age de-

pendency. The middle-income countries in SSA resemble those of non-SSA in terms of their economies, e.g., GDP per capita and savings ratios and the low-income SSA countries in terms of demography, e.g. with high rates of population growth and young age dependency ratios. Their relatively high GDP per capita, resulting from exports of natural resources, has not been translated into broad-based human development, confirming the indispensability of broad-based agricultural development for broadening the base of economic growth.

Table 2. Results of Estimation - Model (1)

	Low-Income Countries						Middle-Income Countries					
	SSA		Non-SSA			East Asia	SSA		Non-SSA		East Asia	
$gdpp_{it-1}$	1.38*** (0.08)	1.40*** (0.07)	1.36*** (0.08)	1.53*** (0.07)	1.37*** (0.46)	1.69*** (0.31)	1.07*** (0.08)	1.09*** (0.07)	1.42*** (0.05)	1.39*** (0.04)	1.21*** (0.15)	1.17*** (0.13)
$gdpp_{it-2}$	-0.44*** (0.08)	-0.41*** (0.07)	-0.58*** (0.06)	-0.60*** (0.07)	-0.25 (0.47)	-0.63 (0.31)	-0.09 (0.08)	-0.11 (0.08)	-0.41*** (0.04)	-0.33*** (0.05)	-0.26** (0.15)	-0.21 (0.12)
sy_{it}	0.03** (0.01)	0.03** (0.01)	0.08*** (0.03)	0.02* (0.01)	0.01 (0.06)	-0.02 (0.04)	0.06*** (0.02)	0.05*** (0.02)	0.07*** (0.01)	0.05*** (0.01)	0.10** (0.04)	0.10** (0.04)
$gpop_{it}$	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.01 (0.02)	0.06** (0.03)	0.05*** (0.02)	0.02** (0.01)	0.02** (0.01)	-0.00 (0.00)	0.00 (0.01)	-0.01 (0.02)	-0.00 (0.02)
$aggdp_{it}$	-0.00 (0.04)		0.25*** (0.05)		-0.17 (0.11)		-0.01 (0.02)		-0.01 (0.03)		0.03 (0.03)	
$empag_{it}$	0.09* (0.05)		-0.06 (0.04)		0.04 (0.14)		0.00 (0.02)		-0.04** (0.02)		-0.02 (0.04)	
$depyoung_{it}$		0.00 (0.05)		0.10** (0.05)		-0.10** (0.05)		0.00 (0.03)		-0.14*** (0.03)		-0.00 (0.03)
no. obs.	86	90	25	28	10	10	47	50	191	192	24	24
no. countries	23	25	8	8	3	3	13	13	50	51	6	6
Sargan test (p-value)	0.18	0.20	0.92	0.63	0.99	0.96	0.10	0.11	0.00	0.01	0.69	0.27

Notes: 1) $gdpp_{it}$, sy_{it} , $gpop_{it}$, $aggdp_{it}$, $empag_{it}$, and $depyoung_{it}$ denote GDP per capita, the ratio of domestic savings to GDP, the rate of population growth, agricultural value added per worker, and the share of labor employed in agriculture, and the young age dependency ratio, respectively. 2) Standard errors are in parentheses. 3) *, ** and *** represent significance levels of 10%, 5% and 1% respectively.

Table 2 presents the results of the panel-data regressions. The coefficient estimates of the agricultural value added per worker, $aggdp_{it}$, are insignificant for both

low- and middle-income countries in SSA. Those of the share of labor employed in agriculture, $empag_{it}$, are significantly positive for low-income countries while insignificant for middle-income countries in SSA. The positive sign for the low-income countries in SSA implies that people in low-income SSA are engaged in *extensive agriculture* using intensive manual labor. The insignificance of the young age dependency ratio, $depyoung_{it}$, in SSA, together with the persistently high ratio of age dependency in SSA implies people's strong preference for having as many children as possible. This tendency underlies the social inertia, hindering economic transformation in SSA.¹⁵⁾ In the same vein, the extremely low rate of domestic savings in the low-income SSA despite the significantly positive contribution of savings to GDP per capita growth reflects people's choice of children as a means of preparation for old age, which impedes accumulation of capital in excess of a threshold. Therefore, lack of broad-based agricultural development prevents the low-income SSA from escaping the poverty trap and the middle-income SSA countries from broadening their economic growth base.

For low-income countries in the non-SSA countries, the coefficient estimate of agricultural value added per worker, $aggdp_{it}$, is large and positive with the elasticity of GDP per capita with respect to it amounting to 0.25. This possibly reflects large positive spillovers from agricultural intensification to other sectors and factors of production in the economy. The coefficient estimate for the young age dependency ratio, $depyoung_{it}$, in an alternative specification of the model is positive, reflecting that increased income due to intensive agriculture allows farm households to have more children. Therefore, the low-income non-SSA countries are supposedly in the phase of early development.

For the small group of low-income countries in East Asia, the coefficient of population growth is significantly positive as for the middle income countries in SSA. The coefficient estimate of the young age dependency ratio is significantly negative. These facts imply that improvements in youth health and body development started to drive the economy. The coefficient of the savings ratio is insignificant, implying some distortions due to, for example, an inappropriate political regime, are at work to deter the economies from proceeding to industrial development.

15) Detailed examination of the data shows that there are a few exceptional middle-income countries like South Africa and Mauritius.

For the middle-income non-SSA countries, the coefficient estimates of the savings rate and the speed of outmigration are positive and negative, respectively; alternatively, those of the savings rate and the young age dependency ratio are positive and negative, respectively. This pattern implies that the middle-income non-SSA countries are probably in economic take-off.

The coefficient estimate of the savings rate, 0.10, is much larger in the middle-income EA countries than that in the middle-income non-SSA countries on average, 0.05 or 0.07. On the other hand the coefficient estimate of outmigration is insignificant while that of the average non-SSA countries is significantly negative.

Put together, the above results for various groups of countries support *Hypothesis 4* of the two-transition approach to an economic take-off on the different stages of economic development and their drivers.

Figure 4. Effects of the initial level of agricultural productivity on the future outmigration

Figure 5. Effects of the initial level of outmigration on the future agricultural productivity improvement

Note: $dempagr = empagr_{2005} - empagr_{1990}$ and $daggrp = aggrp_{2005} - aggrp_{1990}$, where $empagr_{it}$, and $aggrp_{it}$ denote the share of labor employed in agriculture and the agricultural value added per worker, respectively. 2) hi and lo denote the upper bound and the lower bound of the 95% confidence interval. 3) LIC and MIC in the names of country groups are the acronyms for low income countries and middle income countries, respectively. EAP, SSA, and NonSSAonEAP in the names of country groups are the acronyms for the East Asia and Pacific, the Sub-Saharan Africa and the non-Sub-Saharan Africa and non-East Asia & Pacific.

To test the causal role of agricultural development in the structural transformation of a traditional economy as stated in *Hypothesis 2*, we check whether the levels of agricultural value added per worker in the initial year, 1990, help to predict the decreases in the share of labor employed in agriculture over the years from 1990 to 2005 from the plots in Figure 4. In addition, we examine whether the shares of labor employed in agriculture in 1990 help to predict increases in agricultural value added per worker over the years from 1990 to 2005, from the plots in Figure 5.

As shown in Figure 4, the agricultural value added per worker in 1990, $aggdp_{i,1990}$, can explain the changes in the share of labor employed in agriculture or the decline of relative importance of agriculture over the years from 1990 to 2005, $dempagr_{i,2005-1990}$. In contrast, the inverse relationship does not hold; as shown in Figure 5, the initial share of labor employed in agriculture in 1990, $empagr_{i,1990}$, explains few of the changes in agricultural productivity over the years from 1990 to 2005, $daggdp_{i,2005-1990}$. Put together, the two figures imply that the decline of relative importance of agriculture in terms of employment has resulted from agricultural productivity increases, not the other way around.

Table 3. Results of cross-section regressions

Model (2a)	Model (2b)
$dempagr_{2005-1990} = 0.13^{***} - 0.09^{***} aggdp_{1990}$ <p style="text-align: center;">(0.04) (0.01) $R^2 = 0.35$</p>	$daggdp_{2005-1990} = 0.22 - 0.08 empagr_{1990}$ <p style="text-align: center;">(0.08) (0.05) $R^2 = 0.03$</p>

Note: $dempagr = empagr_{2005} - empagr_{1990}$ where $empagr_{it}$ denotes the share of labor employed in agriculture.

Note: $daggdp = aggdpp_{2005} - aggdpp_{1990}$, where $aggdp_{it}$ denotes agricultural value added per worker.

Simple cross-section regressions of the models (2a) and (2b) with the whole sample confirms the interpretations in the plotting exercise above. The estimation result of the model (2a) in Table 3 shows that the decreases in the share of labor employed in agriculture over the years from 1990 to 2005 can be explained with the initial level of agricultural productivity in the initial year 1990, with the R^2 being 0.35. On the other hand, that of the model (2b) shows that the increases in agricultural productivity during the same period had little to do with the share of labor employed in agriculture in 1990, which alternatively represents the initial degree

of relative unimportance of industry in the economy, with the R^2 being mere 0.03.

The result supports the *positive spillovers of agricultural development* as stated in *Hypothesis 2*. It implies that an initially high level of agricultural development facilitates the demographic changes, savings, and outmigration of labor from agriculture over the years to come. It also implies that labor migrates out of agriculture not only attracted by the higher productivity of industry but also empowered by the increased household income due to agricultural development.¹⁶⁾

In addition, the causal role of agriculture disclosed in the above helps distinguish between degrees of validity among arguments in the literature. First, the significantly negative sign of the regression coefficient in model (2a) is aligned with the finding of Temple *et al.* (1998) that the *initial level of social development* positively affects the growth rates of GDP per capita over the years to come. Second, the insignificance of the correlation in model (2b) allows us to reject Matsuyama (1992)'s hypothesis that the initially high productivity of agriculture distracts resources from industry to deter industrial development. Last, the unilateral influence of the initial level of agricultural productivity on the decline of relative importance of agriculture conforms to Jorgenson (1961)'s argument that only when agricultural productivity reaches a threshold does the relative importance of agriculture begin to decline.

V. Conclusions

This paper has revisited the roles of agricultural sector development for Sub-Saharan Africa (SSA) in responding to the twofold challenges – broadening the base of economic growth and sustaining the growth momentum – from a holistic and long-term perspective. It has attempted to establish a case for a two-transition approach to a traditional agriculture-based economy's take-off, where agricultural development in the current generation precedes and prepares for industrial development in the next generation. Novel aspects of the two-transition approach include its emphasis on the stages of economic development, a causal role of agriculture in

16) Another important driver of the outmigration of labor would be provision of infrastructure which lowers transaction costs.

industrial development, and the demographic and savings channels of agriculture's contribution to economic development.

The results of empirical analyses with the time-series data of the SSA and EAP regions and the panel data of developing countries have largely confirmed the validity of the four hypotheses derived from the approach.

The following policy implications can be derived from the analyses in this paper. First, countries in SSA may need to take the policy of *broad-based agricultural development* seriously as a means to initiate broad-based and sustained growth. This is to aim at attaining agricultural sector development by the current generation and industrial development by the next generation instead of attempting headlong to an economic take-off by a 'leapfrogging to industrial development' in a generation. The indispensability of the demographic dividend, which takes at least one generation to create, makes the one transition approach infeasible.

Second, the traditional 'communal ownership of land' needs to be replaced by a modern institution to govern landownership and land use in one way or another. Otherwise it will be very difficult to encourage investments in land, which are essential for an economic transformation and thus to move the economy out of the poverty trap.

To establish the holistic approach on firmer ground, more empirical work needs to be done. Particularly promising topics for further research include empirical studies of the public-good nature of broad-based agricultural development, such as the role of agriculture in enhancing governance and strengthening the nexus between finance and economic growth in early development.

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Appendix

Table A1. List of countries in the SSA and EAP regions
(with East Asian countries underlined)

The SSA region	The EAP region
Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Dem. Rep., Congo Rep., Cote d'Ivoire, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe	American Samoa, <u>Cambodia</u> , <u>China</u> , Fiji, <u>Indonesia</u> , Kiribati, <u>Lao PDR</u> , <u>Malaysia</u> , Marshall Islands, Micronesia, Fed. Sts., <u>Mongolia</u> , Myanmar, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, <u>Thailand</u> , Timor-Leste, Tonga, Tuvalu, Vanuatu, <u>Vietnam</u>

Table A2. List of countries in the panel-data analysis

Low Income Countries			Middle Income Countries		
SSA	Non-SSA	East Asia	SSA	Non-SSA	East Asia
(26)	(9)	(3)	(15)	(52)	(6)
Benin, Burkina Faso, Burundi, Central African Republic, Chad, Congo Dem. Rep., Eritrea, Ethiopia, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Senegal, Sierra Leone, Tanzania, Uganda, Zambia, Zimbabwe	Bangladesh, Haiti, Mauritania, Nepal, Somalia, Tajikistan	Cambodia, Lao PDR, Vietnam	Angola, Botswana, Cameroon, Congo Rep., Cote d'Ivoire, Djibouti, Gabon, Lesotho, Mauritius, Namibia, Nigeria, South Africa, Sudan, Swaziland, Togo	Algeria, Argentina, Armenia, Belarus, Belize, Bhutan, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Guyana, Honduras, India, Iran, Jamaica, Jordan, Kazakhstan, Latvia, Lebanon, Lithuania, Mexico, Morocco, Nicaragua, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Poland, Romania, Russian Federation, Serbia, Sri Lanka, Suriname, Trinidad and Tobago, Tunisia, Ukraine, Uruguay, Uzbekistan	China, Indonesia, Malaysia, Mongolia, Philippines, Thailand

<Abstract in Korean>

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이 논문은 사하라이남아프리카(SSA) 경제가 구조전환을 위해 직면하고 있는 두 가지 도전과제 - 성장의 기반 확충과 지속성 확보 -를 해결하는 데 농업발전이 수행하는 역할을 고찰하였다. 경제의 이륙 메커니즘에 관한 전체론적이고 장기적인 관점과 전형적 SSA경제가 '토지공유제'에 토대를 둔 원시농업경제에 머물고 있다는 분석을 토대로 동 경제의 이륙을 위한 2단계 접근법 즉, 당대의 농업발전과 차세대의 산업발전을 차례로 달성하는 접근법을 제시하고 적합성을 검정하였다.

실증분석 결과 동 접근법에서 시사되는 다음 명제들이 지지되었다. 첫째 경제발전 초기단계에서 농업발전이 산업발전에 대해 긍정적 외부효과를 미치며 그 역은 성립하지 않는다. 둘째 원시경제는 농업발전단계와 산업발전단계를 차례로 거치며 진화하며 농업발전을 통해 인구배당(demographic dividend)과 저축을 생성하지 않으면 산업발전단계로 이행할 수 없다.

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