

Full Length Research Paper

Patterns of agricultural growth and overall growth of the Ugandan economy

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This study aimed at establishing simple stylized facts on relationships between the share of agriculture and its subsectors in GDP and GDP per capita in Uganda. The study utilized both trend and regression analysis tools to achieve the study objective. Previous studies give evidence on what has come to be a stylized fact, that the share of agriculture in GDP falls as the GDP per capita of an economy increases. Our findings by both the trend and regression analysis confirm this stylized fact. However, when agriculture is disaggregated, the pattern that emerges is not consistent with previous studies. Whereas, the overall agriculture and the subsectors of agriculture such as food crops, livestock and forestry share in GDP falls as GDP per capita rises the fishing sector share in GDP does not exhibit a significant relationship with per capita income. The findings also show that whereas the share of non-monetary agriculture, non-monetary food crops, non-and monetary livestock share in GDP exhibit a negative relationship with GDP per capita income, the share in GDP of monetary agriculture, monetary food crops, cash crops, monetary and non monetary forestry and fishing exhibit no significant relationship with GDP per capita.

Key words: Performance, Ugandan economy GDP, per capita, agriculture sector.

INTRODUCTION

This study investigates the pattern of agricultural growth and overall growth of Ugandan economy. The significance of economic structure gained prominence through the seminal work of Lewis (1954) and other subsequent researchers that include, Kuznets (1966, 1971), and Syrquin (1975) and Lance Taylor (1969). These researchers showed that economic structure matters in the development process. Of relevance to this study, is a stylized fact that has been established by many researchers that the share of agriculture in GDP falls as the level of development rises (Branson et al., 1998). However, what is not clear is whether this stylized fact always hold for all countries since most previous studies are cross sectional and if it does, whether it holds for all subsectors of agriculture.

Economic development has historically been associated with structural changes in the national economies. Economic development is sometimes defined as a process combining economic growth with changing share of different sectors in the national product and labor force. The most common structural changes that have been observed historically have followed a sequence of shift from agriculture to industry and then to services. A developing economy is characterized by a predominant share of agriculture, but as the economy

develops further, the share of industry increases and that of agriculture declines and subsequently after reaching a reasonably high level of development, the services sector increases in importance, becoming a major component of the economy. This pattern has not only been observed historically, but also holds across the countries with different levels of development. Structural shifts and changing sectoral shares are found to hold both for the national product and the work force.

Timmer and Akkus (2008) argue that no country has been able to sustain a rapid transition out of underdevelopment without raising productivity in its agricultural sector. The process involves a successful structural transformation where agriculture, through higher productivity, provides food, labor and even savings to the process of urbanization and industrialization. A dynamic agriculture raises labor productivity in the rural economy and pulls up wages. The process also leads to a decline in the relative importance of agriculture to the overall economy, as the industrial and service sectors grow even more rapidly, partly through stimulus from a modernizing agriculture and migration of rural workers to urban jobs.

Despite this historical role of agriculture in economic development, both the academic and donor communities

lost interest in the sector, starting in the mid-1980s, mostly because of low prices in world markets for basic agricultural commodities. Low prices, while a boon to poor consumers and a major reason why agricultural growth specifically, and economic growth more generally, was so pro-poor for the general population, made it hard to justify policy support for the agricultural sector or new funding for agricultural research or commodity-oriented projects (World Bank, 2004). However, with the current high prices in world markets for basic agricultural commodities and the historical role of agriculture in economic development, there is now renewed interest in the agricultural sector.

Most researchers provide evidence that as GDP per capita rises, the share of agriculture in GDP falls. One of the questions that will be addressed in this study is whether this holds true for Ugandan economy. In other words, is there a systematic relationship between agriculture and its subsectors share in GDP and the level of development? As Chenery and Syrquin (1975) pointed out, “a development pattern may be defined as a systematic variation in any significant aspect of the economic or social structure associated with a rising level of income or other index of development”. This study analyzes the pattern of agricultural growth along the definition of Chenery and Syrquin by utilizing data for Ugandan economy from 1987 to 2007, a period that registered high average growth rates in GDP of over six percent. It is interesting to know what happened to the pattern of agriculture during this period of high growth.

STATEMENT OF THE PROBLEM

It is now an established stylized fact that the share of agriculture in GDP falls as the level of development rises. However, the world is changing continuously and current or past patterns of development do not need to hold forever. However, it is also unlikely that all these relationships and stylized facts of the last forty years will suddenly break down and become irrelevant. There is need to continually investigate the patterns of development using new and country specific data to establish whether the relationships continue to hold. With increasing openness of economies and trade playing significant role in them, changes in demand pattern can be met through trade and countries can have a product pattern, very different from the pattern of consumption demand, largely based on comparative advantage. However, we know little about the pattern of agricultural growth in Uganda given the changing world environment, for example, with the current high world prices for basic agricultural commodities.

This study contributes to the existing literature gap by investigating the relationship between agriculture and its subsectors share in GDP and overall growth of Ugandan economy. The major contribution of this study is establishing the relationship between shares of agriculture and agriculture subsectors in GDP and the level of

development by utilizing disaggregated data available for the case of Ugandan economy. Previous studies were mainly cross sectional and the agriculture subsectors were not given due consideration, yet for example, the non monetary sectors in developing countries are large and have different characteristics from the monetary agriculture sectors. This may give rise to aggregation problems and wrong policy prescriptions.

OBJECTIVES

The overall objective of this study is to establish simple stylized facts on relationships between the share of agriculture in GDP and GDP per capita. The specific objectives is to establish the relationships between; share of agriculture in GDP, share of monetary agriculture in GDP, share of non-monetary agriculture in GDP, share of cash crops in GDP, share of food crops in GDP, share of livestock in GDP, share of forestry in GDP, share of fisheries in GDP and GDP per capita. We expected a significant negative relationship between the share of agriculture and agriculture subsectors in GDP with GDP per capita.

SIGNIFICANCE OF THE STUDY

Understanding the pattern of agricultural growth can be important for policy makers in the design of policies that aim at investing in capacities of people to cope with pattern of agricultural growth and to participate in its benefits through better education and health for example. As noted by Timmer and Akkus (2008), a country might experience an extremely rapid transformation—with a falling share of agriculture in GDP and employment—but not experience much economic growth, so the pattern fails to hold. Third, a country might experience extremely rapid economic growth, but fail to have an equally rapid structural transformation, in which case both the pattern and the commensurate transformation fail to hold. The policy implications in each case can be different.

Many structural features exist that can explain why growth and development succeeds or stagnates. Although economic structure cannot be changed in the short run, it is endogenous in the long run. Knowledge about the pattern of agriculture growth for example can act as a guide to appropriate macroeconomic policies to support the changes in economic structure and, thus, achieve development faster than by neglecting the relevance of economic structure.

Most of the available evidence is based on cross country analysis that may not be useful simply because there are considerable amount of variation that exists across countries in terms endowments for example. Because such analysis has been based on the experience of many countries, much remains to be done at the country level. In addition the pattern exhibited by the overall agriculture sector may not be the same across

Table 1. Sectoral Structure of East African economies.

	Agriculture			Manufacturing			Services		
	1987	1997	2007	1987	1997	2007	1987	1997	2007
Kenya	31.5	31.6	22.7	11.6	12.7	11.8	50.0	50.2	58.2
Uganda	56.8	42.0	31.1	5.9	8.6	8.8	33.2	40.5	50.7
Tanzania	62.8	46.8	45.3	-	6.9	6.9	29.1	38.9	37.3

Source: World Bank (2008), World Development Indicators.

agriculture subsectors necessitating different policy choices, yet previous studies have only considered overall agriculture and disregarded its components.

The next section describes the performance and structure of Ugandan economy and her agricultural sector. Section three reviews the existing literature. Section four describes the methodology used in the study. Section five discusses the results and last section provides the conclusion.

PERFORMANCE OF UGANDAN ECONOMY AND UGANDAN AGRICULTURAL SECTOR

Performance and structure of Ugandan economy

In the first decade after independence, Uganda performed very well, with real GDP registering annual average growth rates of over five percent. This rapid growth rate was mainly a product of industrialization based on the import-substitution industrialization (ISI). Another important source of growth was the ability of the economy to sustain high level savings and investment. Macroeconomic stability also contributed to the high growth rates.

After experiencing moderately high growth rates during the 1960s and early 1970s, Uganda began experiencing a decline in per capita incomes. The deterioration in economic performance in the 1974 - 1990 period can be traced to various adverse exogenous factors as well as internal factors. Exogenous developments include the oil crises of 1973 - 1974 and 1979 - 1980 and the consequent world recession, increased protectionism in developing countries, high external interest rates and a decline in concessionary capital inflows, the droughts which adversely affected agricultural production and the breakdown of the East African Community (EAC) in 1977 which significantly reduced market size, bad political leadership under Idi Amin (1971 - 1979), and civil wars between 1979 to 1986.

As a result of the poor performance in the 1980s, Uganda government implemented economic reform measures to stabilize her economy and restore sustainable growth. The policy reforms included trade liberalization, foreign exchange liberalization and minimization of government intervention in the economy. During the close of the 1980s and post 1990s period, there was an

economic upswing. This was partly attributed to the hastened pace of economic liberalization during the period. The other contributing factor for upward swing was the occurrence of good weather which made agriculture the mainstay of the Ugandan economy perform very well. Economic growth for last two decades has averaged over 6% per annum. Uganda's economy had a Gross National Income of US\$ 11.2 billion and a per capita income of US\$403 by 2007 (World Bank, 2008). These figures highlight the low levels of development in Uganda in terms of per capita income despite the high growth rates during the past two decades.

The economic structure of Uganda like other East African economies is dominated by the agricultural sector. It is the main foreign exchange earner and also one of the largest employers. In 2007, the agricultural sector contributed 22.7, 31.1 and 45.3 to total GDP in Kenya, Uganda and Tanzania respectively (Table 1). In Kenya, the agricultural sector grew on average by 3.5% compared to 4.5% and 4.5% in Uganda and Tanzania respectively between 1997 and 2007. It is projected agriculture will remain one of the major sectors in the region in the medium term. With 45.3% of GDP in 2007 accruing from agriculture, Tanzania has the highest dependency on this sector among the East African countries.

The services sector which includes the public sector has been one of the fastest growing and contributes substantially to the regions GDP. Between 1997 and 2007, the services sector grew on average by 5.9, 7.7 and 3.5% in Tanzania, Uganda and Kenya respectively (World Bank, 2008). In 2007, the services sector contribution to GDP was 37.3, 50.7 and 58.2% in Tanzania, Uganda and Kenya respectively. The services sector provides the majority of modern wage employment in all the three East African countries.

The manufacturing sector accounts for a low percentage of GDP compared to the service sector and agriculture sector (Table 2). The manufacturing sector has registered modest growth during the last decade, for instance, the sector grew on average by 6.9, 6.8 and 2.8% in Tanzania, Uganda and Kenya respectively between 1997 and 2007 (World Bank, 2008). Although the share of the manufacturing sector has been growing in both Kenya and Uganda, the increase has been relatively sluggish in Kenya compared to Uganda. Accounting for about 6.9% of GDP in 2007, Tanzania's manufacturing

Table 2. Percentage Government spending on agriculture.

	1975	1980	1985	1990	1995	2000	2004
Expenditure on agriculture (%share in total expenditure)	10.1	32.6	6.5	3.9	1.8	4.0	5.0
Expenditure on agriculture (% share of agriculture output)	2.3	2.8	.02	.86	.00	2.4	4.1
Total expenditure (%share of GDP)	15.7	6.2	15.7	11.7	10.1	20.3	24.0

Source: Government Statistics (IMF, 2007).

sector is one of the smallest in Africa.

PERFORMANCE AND STRUCTURE OF THE AGRICULTURE SECTOR AND EXPENDITURE ON AGRICULTURE SECTOR IN UGANDA

Over the past two decades, Uganda has experienced strong economic growth. However, agriculture has not performed as well as the rest of the economy in recent years and although the incidence of poverty has declined, it is still substantially higher in rural areas than urban areas. Even though agriculture still remains the mainstay of the Uganda economy, its contribution declined from 70% to GDP in 1980, to 53% in 1987 and further dropped to 31% by 2007. The share of monetary agriculture in total GDP was 23.9% compared to 30.2% for non-monetary share in GDP in 1987. However, by 1995, the two sectors had equal shares in GDP but the share for nonmonetary agriculture reduced rapidly to 12.9% compared to 18% by 2007 (UBOS, 2008).

Agriculture is the backbone of Uganda's economy involving 2.5 million farm families, accounting for approximately 31% of the country's GDP and over 90% of exports. The sector also provides the foundation for a number of agro-based industries. Eighty-eight percent of the population in Uganda live in the rural areas and derive a livelihood from farming (UBOS, 2008). Three quarters of the agricultural labour force are women and children. According to MFPED (2006), 76.8% of Uganda's labour force is employed in the agriculture sector, 18.8% in the service sector and 3.2% in the manufacturing sector.

Five main subsectors can be identified: food crops, cash crops, fishing, livestock and forestry. The food crops subsector basically carries the agricultural sector contributing 20.3% to GDP. The rest of the subsectors contributed as follows: livestock 4%; cash crops (exports) 3.2%; fisheries 1.9%; and forestry 1.5% in 2007 (UBOS, 2008). Total cultivable land amounts to 16.7 million hectares, of which 32% is actually cultivated (MAAIF, 2006), one-third of it under perennial crops and the rest under annuals. Among the perennials, bananas dominate, followed by coffee, sugar cane and tea. Food crops (cereals, root crops, pulses and oil seed) also dominate the annuals, followed by cotton and tobacco. Agricultural output comes almost exclusively from smallholders, most (80%) with less than 2 ha of land (Baffoe, 2000). Primary

agricultural commodities, mainly coffee, cotton and tea are the traditional export crops accounting for three-quarters of total exports. Non-traditional exports (15% of the total) include cereals, fish, hides/skins, cut flowers, fruits and vegetables; non-factor services account for the remaining 10% (Baffoe, 2000). Up until 1994, food crops were the main engine of growth in the agricultural sector. However, Uganda could not maintain a consistent improvement in food production. Any increase in food production was mainly due to acreage expansion rather than improved crop yields; with yields of maize, groundnuts, cassava and sweet potatoes actually declining between 1994 and 1997 (Baffoe, 2000).

Government financial statistics obtained from the International Monetary Fund (IMF, 2007) show that the share of public resources allocated to the agricultural sector has been declining steadily, reaching about five percent in 2004, having reached a low level of 1.8 in 1995 (Table 2). This might partly explain the poor performance of the agricultural sector relative to the growth of the economy, for example, livestock subsector which used to account for 9.4% of GDP in 1987 accounted for only 4% by 2007 (UBOS, 2008).

LITERATURE REVIEW

Modern analyses of sectoral transformation originated with Fisher (1935, 1939) and Clark (1940), who dealt with sectoral shifts in the composition of the labor force. However, they were probably the first to deal with the process of reallocation during the epoch of modern economic growth and to use the form of sectoral division (primary-secondary-tertiary) which, in one way or another, is still with us today (Syrquin, 1988). The most traditional measures of economic structure are sectoral shares of the labor force, consumption patterns and variables measuring income distribution. Kuznets (1966) examined these three categories in more detail and added the analysis of sectoral shares of GDP and was able to empirically demonstrate that growth is brought about by changes in sectoral composition. Kuznets provided the historical empirics and conceptual framework for modern analysis of the structural transformation, although he used no econometric techniques himself. The first quantitative analyses of patterns in the transformation process were by Chenery and Taylor (1968) and Chenery and Syrquin (1975).

Historical pattern of economic development of today's developed countries has, no doubt, followed a common pattern and this is well documented by Kuznets (1966) and others. Share of agriculture has seen a steady decline in total output, that of industry registered an increase for a considerably long period and then has shown a decline. And the share of services has steadily increased all through, but the rate of increase seems to have accelerated in the latter half of the twentieth century, the period during which industry has seen a decline in its share and therefore, is often described as a period of 'deindustrialization' in the developed countries (Rowthorn and Wells, 1987).

The timing of the different phases of structural changes and speed of such changes have, of course, been different among different countries. In the 'pre-modern' era, which according to Kuznet's assessment ended at different points of time during the nineteenth century in different countries (e.g. before 1800 in Great Britain, 1835 in France, 1861 in Italy, 1870 in USA, 1878 in Japan, etc.), agriculture accounted for a half to two-thirds of the total output. It seems to have taken about 75 to 100 years for this share to decline to about one-fourth in the case of most European countries, though similar shift was achieved more swiftly in North America and Japan, the relative latecomers in modern economic development. In spite of differences in time of entering the era of modern development and in the speed of transformation, the share of agriculture had declined to less than 15% in most of these countries by middle of the twentieth century and has seen a further continuous decline since then, reducing it to less than 5% in all of them, by the end of the twentieth century.

Industry held a share of around 25% at the beginning of the 'modern' development in most of the developed countries of today. It grew steadily and reached the peak of about one-half by 1950's in all these countries irrespective of the period when they entered the industrialization phase. And all the developed countries have seen a decline in the share of industry in their output since the 1950's. By and large, the changes in the share of industry have been observed to be hump-shaped (Kuznets, 1966, World Bank, 1988 and Echevarria, 1997). In most of the countries, industry has the same share in output in the beginning of the twenty-first century as it had in the beginning of their journey to 'modern' economic growth. In 2002, the share of industry in national output in the United Kingdom was 26%, comparable to 23% in 1801; in France, 25%, the same as in 1841; in Germany, 23% compared to 24% in 1841; in Italy, 29% comparable to 22 in 1901; and in USA, 23% comparable to 20% in 1841 (Kuznets, 1966; World Bank, 1983; 2004).

The services sector has experienced a secular increase in its share right through the period of modern economic growth in all countries, except for an initial decline in a few countries, namely Great Britain, France

and Germany. The share crossed the 50% mark by 1901 in Great Britain, saw a decline till about mid-1950's and crossed 50% again by 1960, by when most other countries, France, Germany, Italy and Japan had crossed this mark for the first time. The United States had hit a 50% mark for services in its GDP earlier. There has been a continuous and a relatively fast increase in the share of services since the 1960's and by now, it stands at 68 to 75% in all the countries; the highest being 75% in the case of the United States, followed by the United Kingdom at 73%, France at 72% in 2002. It is somewhat lower at 68% in Japan.

Structural shifts in output have generally been accompanied by similar shifts in employment. So that when output share of agriculture in the United Kingdom declined from 32% 1801 to 22% in 1841 and further to 6% in 1901, its employment share also declined correspondingly to 35, 23 and 9%. And when output share of industry rose from 23% in 1801 to 40% in 1901 and 56% in 1955 and declined to 42% by 1980, the corresponding change in its employment share were from 29 to 54%, 57 and 38%.

In a comparative study by Papola (2005) agriculture, expectedly, registered a decline in its share in GDP in Thailand, Korea, India, China and Malaysia during 1960 - 2002, the largest decline being in the case of Thailand (from 40 to 9%) and Korea (from 37 to 4%). Thus while the GDP share of agriculture in China declined from 30% in 1980 to 15% in 2002, its employment share declined from 69 to 47. Corresponding shifts between 1960 and 2002 were: from 50 to 18% in GDP and from 75 to 44% in employment in Indonesia; and from 40 to 9% in GDP and 84 to 46% in employment in Thailand. Only in Malaysia the decline in labor force in agriculture has been commensurate with that in GDP from 63 to 18% in the labour force. In India, shifts during 1960 - 2002 have been from 55% 24% in GDP and from 74 to 60% in labour force.

The reasons why structural shift will take place are seen differently by different economists. Earlier economists like Fisher and Clark seem to take it for granted that it happens due to changing demand pattern. Fisher and Clark, basing their arguments on Engel's Law, thought that shift from agriculture to industry takes place as a result of low income elasticity of demand for agricultural products and high income elasticity of demand for manufactured goods and services. As a result, with rising levels of income, the demand for agricultural products relatively declines and that for industrial goods increases and after reaching a reasonably high level of income, demand for services increases sharply. Accordingly, the shares of different sectors in the national product get determined by the changes in the pattern of demand. Fisher (1939, 1946) emphasized saturation of demand for manufactured goods and high income elasticity of demand for services. Basing his argument on the so-called "hierarchy of needs", Clark agreed that final demand will increasingly shift to services, but shift of labour force

takes place, according to him, due to high productivity of manufactured goods and low productivity of services. Fisher argued that services are “luxuries” with an income elasticity of demand greater than unity and therefore, at higher income levels an increasing share of expenditure is absorbed by them, which leads to high share of services in output and labor force. Clarke argued that demand for manufactured goods saturates, settling at around 20 to 25% and with continuing decline in the demand for agricultural products, the demand that for services rises. While Fisher assumed that increase in the share of services in final demand directly and proportionately translates into its share in employment, Clark, attributes the increase in the share of services in employment also to low productivity in services than in manufacturing.

Later economists like Bamoul and Fuchs see a rise in the share of services in employment primarily in productivity differentials between industry and services sectors, demand shifts playing a minor role. Bamoul, assuming that share of goods and services in real output is constant overtime time and across countries and basing his conclusion on a study of six developed (Canada, Germany, France, Japan, UK and US), over the period 1948 - 1995, finds that a higher and rising share of service sector in employment in high income countries is explained by low productivity of this sector. Victor Fuchs in his study of 48 US States over the period (1929 - 1965) also sees the lagging productivity growth of the services sector, as the reason for its rising employment share.

On the supply side, agriculture being mainly dependent on a fixed factor of production, namely land, faces a limit on its growth and is subject to early operation of the law of diminishing returns. Industry, specially manufacturing, on the other hand, offers large scope for use of capital and technology, which could be augmented almost without limit with human effort. Labour supply could constrain expansion of industry, but it is possible to overcome it by introducing labour-saving technological changes. The same applies to services, where application of technologies seems to offer much larger scope, as shown by the experience over the past few decades.

In the case of services, there are also additional reasons why their share in national product increases with industrial development. These arise both out of the technological developments and economic and institutional arrangements compelled by them (Kuznets, 1966). Technological developments facilitate and economically necessitate geographical concentration and large scale based production, leading to larger requirements of transport, storage and communication. In a predominantly rural economy, most of the food is produced close to the consumers; but with increasingly larger population getting located in urban areas, requirements of transport and trade increase even for reaching food to the consumers. Increasing demand for housing in urban areas leads not only to the expansion of construction activity,

but also leads to demand for housing related services, which are generally not common in villages. Further, higher income levels not only give rise to higher demand for personal services such as education, health and recreation, but new, technology based modes of meeting them lead to demand for other services.

Kuznets (1971) saw income elasticity of demand as the primary reason for changes in economic structure, but recognized that other factors, technological and institutional, also play an important role in accelerating these changes. Emphasizing primarily the supply side, Kaldor (1966, 1967) considered manufacturing as the engine of growth: agriculture being subject to diminishing returns, is not able to sustain an increasing level of production and income, and, therefore, manufacturing, without such limitations on expansion of production, is the key to sustained economic growth. Growth of services, according to Kaldor, was induced both by requirements of expanding industrial sector and rising levels of income.

The ‘demand side’ explanation based on differences in income elasticity of demand is questioned by economists like Bamoul (1967, 2001) particularly in regard with the shift of labour force to services. According to this line of argument, employment shift does not result from changing final demand, but from differential productivity growth. Since service sector productivity rises slower than manufacturing activity, employment share of the services sector tends to grow faster and becomes high in the developed countries. Victor Fuchs (1968) in his classical study of the emergence of domination of services sector in the United States corroborates the view propounded by Bamoul and concludes that shift to services is largely a result of productivity differentials. He finds that income elasticity of demand for services is only slightly higher (1.07) than for goods (0.93) and that for non-food goods is similar to that of services.

The persistence in development pattern implies that structural differences remain relevant for understanding the development process. However, the interest in structural analysis has decreased considerably since the emergence of the so-called new or endogenous growth theory. Endogenous growth theory relates economic growth to production functions with either increasing returns to scale or non diminishing returns to reproducible capital. Aggregate production functions used in the growth literature have been criticized for not taking into account changes in sectoral composition (Pack, 1994), who refers explicitly to Denison (1985). Denison (1985) finds that intersectoral shifts in production explain part of aggregate growth. Pasinetti (1994) has criticized new growth theory for being “essentially one-commodity models, with no structural change.” Cornwall and Cornwall (1994) use a structuralist model of Sundrum (1991) to show that, whereas new growth theory endogenizes growth, it neglects aggregate demand and distributional shifts in output and employment. By analyzing the European integration, they show that economic structure

matters. Structural changes do not only characterize economic development, they are also necessary for sustaining economic growth. The neoclassical view that sectoral composition is a relatively unimportant by-product of growth has been convincingly questioned by structural economists like Kuznets, who have empirically demonstrated that growth is brought about by changes in sectoral composition. This is so both for the reasons of demand and supply.

Changing structure of demand with increasing per capita income levels induces changes in production structure, but at the same time, changes in technological conditions of production, increasing scale and concentration of production and institutional arrangements necessitated by changes in location of production and population, also have significant influence on the pattern of these changes. Further, the response of changing consumption demand pattern on production structure in the national economies, will vary depending on the close or open character and trading possibilities of a country. While in a closed economy, the domestic production structure will need to respond to the changing demand pattern as much as its production capacity permits, in an open economy, demand for certain commodities can be met by imports while the national production structure will primarily be determined by comparative advantage.

METHODOLOGY

Trend analysis

We utilized trend analysis to compliment findings from regression analysis and also to familiarize with general pattern or trend of the data. Trend analysis was used to spot any pattern or trend, for example, by observing whether the shares of agriculture and its subsectors were trending up, trending down or constant in relation to per capita income. The goal was to see if there are any systematic patterns over time.

Regression analysis

Most time series data are generally not stationary and the use of time series data has become a controversial and complicated issue. For example, although it is common practice to take first differences to remove most of the trend, this has led to increased criticism that first differencing implies an important loss of information. Furthermore, the method of first differencing is certainly unacceptable for the estimation of pattern of agriculture, because first differencing would turn the pattern of development analysis into a growth analysis. Given this situation and the limited goal of this study, we limit the analysis to regressions, using ratios of annual data from 1987 to 2007. The specifications for agriculture and its subsectors share in GDP variable is adapted from the principal specification of Chenery and Syrquin (1975), Syrquin and Chenery (1989) and Branson et al. (1998):

$$\ln X = \alpha + \beta \ln Y + \lambda \ln N + \delta \ln F + \varepsilon$$

where;

X is the dependent variable, taken as the share of agriculture and agriculture subsectors in GDP.

Y is the income level measured as GNP per capita.

N is the country's population density.

F is the net resource inflow, measured as imports minus exports of goods and

nonfactor services as a share of total GDP.

ε is the error term.

Definition of variables

Agriculture

Agriculture covers the contribution of cash crops, food crops, livestock, forestry and as well as fishing to GDP. The contribution of agriculture to GDP data is disaggregated according to monetary and non monetary values and according to the above mentioned sub-sectors of agriculture.

GDP per capita

GDP per capita is used in this study as a proxy of the level of development. This is common proxy for development level that have been consistently used by previous studies (Branson et al., 1989; Syrquin and Chenery, 1989).

Population density

The population density variable controls for country size and effects of economies of scale. Studies, such as Syrquin and Chenery (1989) and Branson et al. (1998), used population density to control for effects of economies of scale because from a theoretical point of view, it is a better proxy for economies of scale than population size. Population density was calculated by dividing total population in a given year by the land area which is measured in square kilometers.

Net resource inflows

The current account balance before official transfers is the net resource inflow measured as imports minus exports of goods and nonfactor services as a share of total GDP.

Robustness

The various tools of analysis, provide a considerable basis for evaluating the robustness of the results related to the relationship between agriculture structure (X) and the level of economic development (Y). We are especially interested in the value and sign of the t-statistic of β , because β is the estimated coefficient for GDP per capita. For a regressor to be considered significant we have required the usual significance level of 90%.

Data used

The data used in the analysis was drawn from a statistical abstracts (several issues) published by Uganda Bureau of Statistics (UBOS). Data on shares of agriculture and agriculture subsectors, per capita income, population size, net resource flows and official exchange rates were all obtained from the same source. The data used in this study range from 1987 to 2007, a period when Uganda registered average growth rates of 6.4% per annum. This period is also a period when Uganda experienced relative stability in macroeconomic variables and political situation.

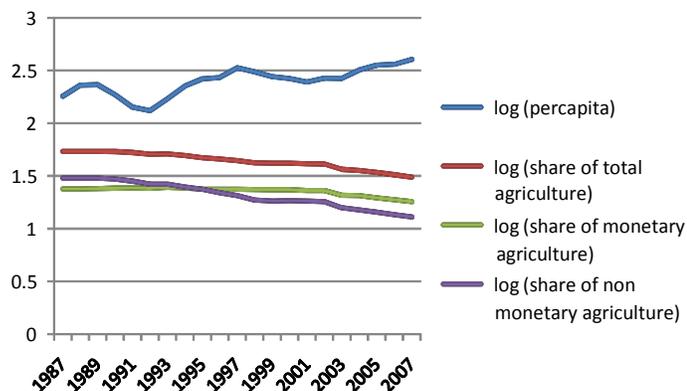


Figure 1. Trend of total agriculture, monetary and non-monetary agriculture share in GDP.

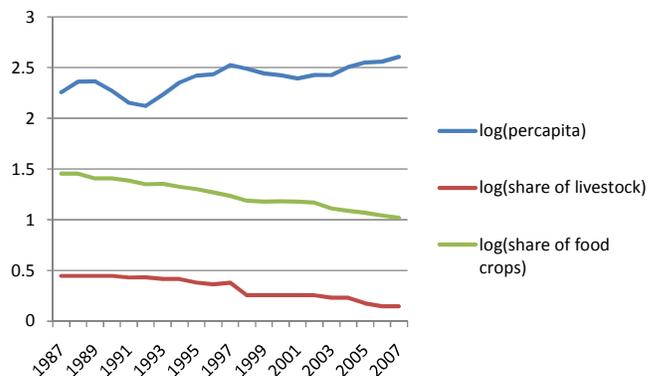


Figure 3. Trend of non-monetary share of food crops and livestock in GDP.

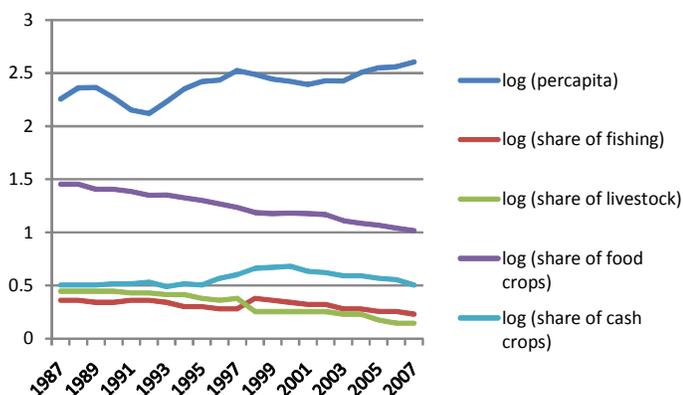


Figure 2. Trend of monetary share of food crops, fishing, livestock, and cash crops in GDP.

share of cash crops in GDP has no clear pattern. This seems to suggest that factors outside the economy may be influencing the trend of the share of cash crops in GDP. Since most of the cash crops are exported, world market forces and comparative advantage, for example, may be influencing the trend. This finding may imply different policy implications compared to previous which had aggregated agriculture.

Figure 3 shows also a downward trend of non-monetary share of food crops and livestock in GDP as expected. It can be observed that the fall in the share of share of livestock and food crops is slightly higher than the rise in per capita income. Although the observations made under trend analysis are revealing, they need to be confirmed by regression analysis. The next sub-section discusses regression results.

DISCUSSION OF RESULTS

Trend analysis results

It can be observed in Figure 1 that the share of overall agriculture in GDP has a downward trend when compared with per capita income that had an upward trend. This observation is consistent with earlier findings which show that as GDP per capita rises, the share of agriculture in GDP falls. However, the trend is much steeper for non-monetary agriculture share in GDP compared to the trend for monetary agriculture share in GDP. This is an interesting observation that has not been noted by previous researchers. This observation suggests that as GDP per capita increases, the non-monetary sector contribution to GDP falls faster than the monetary agriculture contribution to GDP. The policy implications in this case is different from earlier evidence by previous studies.

Figure 2 shows that the monetary share of food crops, fishing and forestry in GDP has a downward trend that is a consistent with previous study findings. However, the

Regression results

Results of earlier studies demonstrated that the share of agriculture decreases as development proceeds. The regression analysis confirm these relationships except for the fishing subsector (Table 3). The non-significance of the coefficient of GDP per capita income in the regression where the share of fishing in GDP is the dependent variable may be due to the fact that fish in Uganda is now more of tradable good and thus more likely to be affected by international factors than local factors such as changes in per capita income.

When agriculture is disaggregated, results show no relationship between monetary share of agriculture in GDP and GDP per capita, a finding that is not consistent with previous studies though with the expected sign. The share of monetary food crops, cash crops, fishing and forestry in GDP also has no relationship with GDP per capita (Table 4). This finding may be due to the fact monetary agriculture is determined mainly by regional and international markets factors than by the domestic GDP per capita income. Uganda exports most of her food

Table 3. Empirical results of the structure of agriculture and its subsectors regressions.

Variables	Dependent variable (total share in GDP)				
	Agriculture	Food crops	Livestock	Fishing	Forestry
Log (per capita income)	-.146 (-3.36)*	-.166 (-3.93)*	-.237 (-2.34)**	-.112 (-1.59)	-.148 (-4.56)*
Log (population density)	-.664 (-13.41)*	-.746 (-12.7)*	-1.15 (-8.11)*	-.266 (-2.69)**	-.295 (-6.51)*
Log (percentage of net resource inflow to GDP)	.0733 (3.2)*	.115 (4.2)*	.167 (2.6)**	-.0618 (1.4)	.0789 (3.76)*
Constant	3.405 (44.1)*	3.48 (37.9)*	3.853 (17.5)*	1.111 (7.2)*	1.283 (18.17)*
R-squared	.97	.97	.92	.68	.93

Table 4. Empirical results of the structure of monetary agriculture and its subsectors regressions.

Variables	Dependent variable (monetary share in GDP)					
	Agriculture	Food crops	Cash crops	Livestock	Fishing	Forestry
Log (per capita income)	-.0539 (-1.13)	-.0318 (-.44)	.18 (1.4)	-.251 (-2.2)**	-.0963 (-1.59)	-.0963 (-1.5)
Log (population density)	-.323 (-4.8)*	-.0626 (-.62)	.0593 (.32)	-1.28 (-7.98)*	-.254 (-2.8)	-.254 (2.8)*
Log (percentage of net resource inflow to GDP)	-.00115 (-.04)	-.00926 (-.2)	.195 (2.3)**	.174 (2.35)*	.0704 (1.7)	-.0705 (1.7)
Constant	2.133 (20.5)*	1.256 (7.93)*	-.181 (-.63)	3.98 (15.96)*	.988 (7.08)*	.988 (7.08)*
R-squared	.80	.96	.36	.92	.70	.11

Table 5. Empirical results of the structure of non-monetary agriculture and its subsectors regressions.

Variables	Dependent variable(non monetary share in GDP)				
	Agriculture	Food crops	Livestock	Fishing	Forestry
Log (per capita income)	-.251 (-4.05)*	-.253 (-3.6)*	-.204 (-2.59)**	-.245 (1.56)	-.136 (-1.3)
Log (population density)	-1.0267 (-11.85)*	-.181 (-11.84)*	-.894 (-8.14)*	-.366 (-1.66)	.132 (.91)
Log (percentage of net resource inflow to GDP)	.148 (3.69)*	-.184 (-3.96)*	-.151 (-2.98)*	.00109 (-.01)	-.0359 (-.53)
Constant	4.13 (30.6)*	4.4 (28.4)*	2.759 (16.12)*	.74 (2.16)**	.0167 (.07)
R-squared	.96	.96	.93	.52	.11

crops to the neighboring countries and also exports most of the fish and cash crops to international markets. This might suggest that the pattern of growth of the share of monetary agriculture is not determined by the level of development of the country as previous evidence would suggest but by other regional and international factors. The policy implication is that there is need to design policies that can increase the competitiveness of the monetary agriculture by increasing productivity and efficiency through adaptation of high yielding varieties, irrigation, application of fertilizers, improved infrastructure and agricultural processing.

Table 5 shows results of the relationship between non-monetary share of agriculture and agriculture subsectors in GDP and GDP per capita. The results are as expected except for the fishing and forestry sub-sector where the coefficients of GDP per capita income was not significant. The reason why non-monetary fishing sector has no significant relationship with per capita income may be as a result of fish becoming a tradable good in the recent

years and this might be affecting the non-monetary fishing sector. The finding of a negative relationship between non-monetary agriculture and GDP per capita is consistent with previous studies findings although previous studies did not disaggregate the agriculture sector.

This finding highlights the importance of disaggregating data when analyzing the pattern of growth not only for agriculture sector but also for other sectors. The policy implication for the case where aggregated data is used could be different from the case where disaggregated data is used. Timmer and Akus (2008) argue that hunger and malnutrition persist in many countries, often because past patterns of agricultural growth were insufficient or failed to adequately benefit the poor. Since it now established that in the Ugandan case, that the share of non-monetary food sub-sector and non-monetary livestock sub-sector share in GDP falls as GDP per capita income rises, it is important to prepare participants in these shrinking sub-sectors through training so that they can be absorbed in the expanding sectors.

Conclusion

This study aimed at establishing simple stylized facts on relationships between the share of agriculture and its subsectors in GDP and GDP per capita in Uganda. The study utilized both trend and regression analysis tools to achieve the study objective. Previous studies provide evidence on what has come to be a stylized fact, that the share of agriculture in GDP falls as the GDP per capita of an economy increases. Our findings by both the trend and regression analysis confirm this stylized fact. However, when agriculture is disaggregated the pattern that emerges is not consistent with previous studies. Whereas, the overall agriculture and the subsectors of agriculture such as food crops, livestock and forestry share in GDP falls as GDP per capita rises the fishing sector does not exhibit a significant relationship with GDP per capita income.

The findings also show that whereas the share of non-monetary agriculture, non-monetary food crops, non-and monetary livestock share in GDP exhibit a negative relationship with GDP per capita income, the share in GDP of monetary agriculture, monetary food crops, cash crops, monetary and non monetary and fishing subsectors exhibit no significant relationship with GDP per capita. This highlights the importance of disaggregating the agricultural sector because the policy implication could be different. The policy implication that arises from the study findings is that it is important to prepare participants in the shrinking non monetary food crops and livestock sub-sectors through training so that they can be absorbed in the expanding sectors. In addition there is need to design policies that can increase the competitiveness of the monetary agriculture sector by increasing productivity and efficiency through adaptation of high yielding varieties, irrigation, application of fertilizers, improved infrastructure and agricultural processing.

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