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Structural transformation and labour market development in Sub-Saharan Africa: Evidence from Ghana and Nigeria

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Kurzfassung

Die vorliegende Dissertation untersucht die sich verändernde Wirtschafts- und Beschäftigungsstruktur in Subsahara-Afrika im Allgemeinen und mit einem Fokus auf Ghana und Nigeria. Es ist in eine Einführung und vier Hauptkapitel gegliedert, die jeweils spezifische Forschungsfragen beantworten, die zum Hauptziel beitragen. Das zweite Kapitel gibt einen Überblick über die Bedeutung des Agrarsektors. Das dritte Kapitel analysiert vergleichend strukturelle Transformationsprozesse in Subsahara-Afrika (SSA) und Südostasien (SEA). Das vierte Kapitel analysiert Art und Struktur des Arbeitsmarktes in Ghana und Nigeria. Das fünfte Kapitel befasst sich mit einer der politischen Strategien für den effektiven Einsatz landwirtschaftlicher Arbeitskräfte, indem es die Determinanten und das Ausmaß der Beteiligung landwirtschaftlicher Haushaltsarbeitskräfte bei der Weiterverarbeitung landwirtschaftlicher Rohstoffe untersucht. Hauptsächlich wurde mit einer Kombination aus Zeitreihen- und Querschnittsdaten gearbeitet. Basierend auf deskriptiv-statistischen Methoden werden strukturelle Veränderungen und der Wandel des Arbeitsmarktes dargestellt. Ein Heckman-Auswahlmodell wurde verwendet, um Faktoren zu analysieren, die die Entscheidung zur Teilnahme an der Lebensmittelverarbeitung sowie den Umfang der Teilnahme beeinflussen. Insgesamt zeigt sich deutlich, dass der Anteil der Landwirtschaft am Volkseinkommen und an der Beschäftigung zurückgegangen ist. Die pflanzliche Produktion trug in beiden Ländern am meisten zur landwirtschaftlichen Wertschöpfung und Beschäftigung bei. In einer vergleichenden Studie zur wirtschaftlichen Entwicklung wurde festgestellt, dass die sektorale Transformation in den SEA-Ländern zu einem großen Teil durch die Migration von landwirtschaftlichen Arbeitskräften in das verarbeitende Gewerbe und die Industrie erfolgte, während die SSA-Länder eher durch eine Arbeitsmigration in den Dienstleistungssektor gekennzeichnet waren. Die Ergebnisse zur Beschaffenheit des Arbeitsmarktes zeigen, dass ein größerer Anteil der Arbeitskräfte in SSA in den Teilsektoren Handel und sonstiger Handel, Pflanzenbau und gemischte Landwirtschaft beschäftigt war. Darüber hinaus ließ sich – ungeachtet der Dominanz von selbständiger landwirtschaftlicher Tätigkeit – ein erhebliches Wachstum privater Lohnarbeit im Agrarsektor feststellen. Es gab einen Abwärtstrend bei der Realentlohnung in allen Teilsektoren im Agrarsektor, was einen Katalysator für die Abwanderung von Arbeitskräften aus dem Sektor darstellt. Im abschließenden Analysekapitel wurde festgestellt, dass Landknappheit und Vermögensniveau die Beteiligung landwirtschaftlicher Haushalte an der Lebensmittelverarbeitung positiv beeinflussen, nicht jedoch das Ausmaß der Beteiligung. Ein höheres Niveau der wirtschaftlichen Entwicklung auf Bezirksebene führt eher zu einer geringeren Wahrscheinlichkeit einer

Diversifizierung in die Lebensmittelverarbeitung und deren Intensivierung durch landwirtschaftliche Haushalte. Zusammenfassend liefert diese Studie empirische Belege für einen rückläufigen, aber immer noch bedeutenden Agrarsektor in den Volkswirtschaften von SSA, und im Gegensatz zu seinem asiatischen Pendant dominiert der Dienstleistungssektor den sektoralen Wandel, während der Industriesektor bisher nur eine untergeordnete Rolle im Entwicklungsprozess gespielt hat. Derzeit binden landwirtschaftliche Lebensmittelverarbeitungsaktivitäten auf Haushaltsebene überschüssige landwirtschaftliche Arbeitskräfte, insbesondere auf landwirtschaftlichen Betrieben, die mit Landknappheit konfrontiert sind. Langfristig werden die Lebensmittelverarbeitungsaktivitäten auf landwirtschaftlicher Ebene jedoch wahrscheinlich von der aufstrebenden Lebensmittelverarbeitungsindustrie übernommen werden. Dennoch ist die Förderung von Verarbeitungsaktivitäten durch Farmhaushalte in der landwirtschaftlichen Wertschöpfungskette eine potenzielle Option für die Beschäftigung von nicht migrierten Arbeitskräften, solange außerlandwirtschaftliche Beschäftigungsmöglichkeiten fehlen oder von geringer Attraktivität sind.

Schlüsselwörter: Strukturwandel; Arbeitsmärkte; Agrarverarbeitung; Subsahara-Afrika; Ghana; Nigeria

Abstract

The thesis examines the changing economic and employment structure in Sub-Saharan Africa by focusing on Ghana and Nigeria. It is structured into an introduction and four main chapters, each answering specific research questions contributing to the main objective. The second chapter presents an overview of the agricultural sector's importance. The third chapter comparatively analyses structural transformation processes in Sub-Saharan Africa (SSA) and South-East Asia (SEA). The fourth chapter analyses the nature and structure of the labour market in Ghana and Nigeria. The fifth chapter looks into one of the policy strategies for using agricultural labour effectively by examining the determinants and extent of farm household labour participation in agro-processing. A combination of time series and cross-sectional databases were mainly used. Based on descriptive statistical methods, structural changes and the changing nature of the labour market are illustrated. A Heckman selection model was used to analyse factors that influence the decision to participate in food processing as well as the level of participation. Overall, it shows that the agricultural share in national income and employment has been declining. The crop sub-sector contributed most of the agricultural value added and employment in both countries. In a comparative study of economic development, we found that while the sectoral transformation in SEA countries happened to a large extent by farm labour migration to manufacturing and industry, SSA countries were rather characterised by labour migration to the services sector. Results on the nature of the labour market showed that a greater share of labour in SSA was employed in the trade and other commerce, crop production, and mixed farming sub-sectors. Further, we found substantial growth in private wage jobs amid the dominance of self-employment and non-wage jobs. There was a decreasing trend in the real wage levels of all sub-sectors in the agricultural sector which is a catalyst for labour out-migration from the sector. In the final analysis chapter, land constraints and asset-rich households were found to positively determine farm household participation in food processing, but not the extent of participation. Higher levels of economic development at the district level rather result in less likelihood of diversification into food processing and its intensification by farm households. In conclusion, this study provides empirical evidence of a declining but relevant agricultural sector in the economies of SSA and, unlike its Asian counterpart, the service sector dominates sectoral change, whereas the industrial sector has only played a minor role in the development process so far. Farm household-level food processing activities currently absorb surplus farm labour, particularly on farms facing land constraints. In the long run, however, f the emerging food processing industry will likely take over food processing activities at the farm level Nevertheless, fostering

farm-level agro-processing in the agricultural value chain is a potential option for the employment of non-migrated farm labour as long as off-farm job opportunities are unattractive or lacking.

Keywords: Structural change; Labour markets; Agro-processing; Sub-Saharan Africa; Ghana; Nigeria

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Abbreviations

Acronym	Definition
APP	Agriculture Promotion Policy
ASCo	Ayensu Starch Company
ATA	Agricultural Transformation Agenda
BMBF	German Federal Ministry of Education and Research
BMZ	German Federal Ministry for Economic Cooperation and Development
CBN	Central Bank of Nigeria
COVID-19	Corona Virus Disease 2019
CPO	Crude Palm Oil
CSB	Corn Soy-Blend
DAAD	German Academic Exchange Service
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organisation Statistics
FCR	Fresh Cassava Roots
FDP	Food Development Project
FFB	Fresh Fruit Bunch
FMARD	Federal Ministry of Agriculture and Rural Development
FSP	Fertilizer Subsidy Programme
GDP	Gross Domestic Product
GGBL	Guinness Ghana Breweries Limited
GHS	General Household Survey
GLSS	Ghana Living Standard Survey
GSGDA	Ghana Shared Growth and Development Agenda
GSS	Ghana Statistical Service
HQCF	High-Quality Cassava Flour

IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILR	Institute for Food and resource economics
IMF	International Monetary Fund
ISI	Import Substitution Industrialisation
ISIC	International Standard for Industrial Classification
JHS	Junior High School
METASIP	Medium-Term Agriculture Sector Investment Plan
MoFA	Ministry of Food and Agriculture
MPL	Marginal Labour Productivity
NBS	National Bureau of Statistics
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing Power Parity
PSI	President's Special Initiatives
SAP	Structural Adjustment Programme
SEA	South-East Asia
SHS	Senior High School
SOEs	State-Owned Enterprises
SSA	sub-Saharan Africa
TMS	Tropical Manioc Selection
WAMCO	West African Mills Company Limited
WAML	West Africa Markets Link
WDI	World Development Indicator

Chapter 1
Introduction and research context

This chapter situates the context of the study into perspective by stating its motivation and objectives. An exposition of the data and methodologies used is presented. Subsequently, the structure and contribution of the main topics, as well the as limitations and outlook of the thesis are stated.

1.1 Background

Ghana and Nigeria are two Anglophone West African states, separated by the land border of the Togo and Benin republics. Both countries are ethnically diverse but share significant historical similarities like politics, socio-economics, and ecology. The most marked political characteristic is their transition from prolonged military rule, a few years of civilian governance post-independence, to a democratic dispensation in 1992 (Ghana) and 1999 (Nigeria) (Ita & Atai, 2018). Economically, although Nigeria has a large economy (about $492.07 billion in GDP economy in 2018) compared to Ghana (about $58.65 billion in GDP economy in 2018), both countries embarked on state-initiated industrialisation after independence. Both countries, however, experienced early de-industrialisation following economic management bottlenecks. They opted for the structural adjustment programme (SAP) in 1983 for Ghana and 1986 for Nigeria to help deal with the challenges (Chenaf-Nicet & Asse, 2021; Ogbonna, 2012; World Bank, 2020).

Located between the Sahara Desert and the Gulf of Guinea, both countries share similar agroecological features. Over the years, they have been producers and traders in agricultural commodities and products of cocoa, oil palm, rubber, maize, millet, cassava and more, as well as various livestock including cattle, sheep and poultry. The agricultural sector continues the contribute to the has contributed significantly to the Ghanaian and Nigerian economic growth.

Traditionally, the agricultural sector has been the source of employment and income in the African sub-region. While the relevance of the agriculture sector to the rural population is common, recent surveys suggest that agriculture is also the primary source of livelihood for about 15% of urban households in the sub-region (OECD & FAO, 2016; Yeboah & Jayne, 2015). The employment provided by the sector is from labour-intensive raw agricultural subsistence production (Hall & House, 1994) and has the characteristics of low-level agricultural mechanisation (Daum & Birner, 2020).

In Ghana and Nigeria, the agricultural sector in 2018 contributed about 19% and 21% to GDP respectively. In the same year, about 31% and 35% of the labour force in both countries were employed in agriculture (World Bank, 2020). The role of the agricultural sector in the development process cannot be underemphasised. In the work of Lewis (1957) and other development economists, it is the cradle of the development process. The Lewis two-sector model, in particular, suggests a labour movement from a less productive traditional (agricultural) sector to a more productive modern (industrial) as the economy develops. For the model to be sustainable, the traditional sector is supposed to provide surplus labour to meet growing demand in the non-agricultural sector. However, non-agricultural economic growth in most countries in Sub-Saharan Africa (SSA) has been slow as compared to most Asian economies. Its non-farm sector is therefore not able to absorb the labour surplus generated by rural population growth. In addition, land scarcity and the labour-saving technical progress in farming, creates rising rural underemployment at least outside the peak working seasons (Engel et al., 2017; Rao, 2006), giving rise to alternative strategies to use this labour surplus, such as on-farm processing.

On-farm processing might absorb both surpluses in labour and product residues. Before exploring farm labour use as this, the thesis examines the importance of agriculture to the economies of Ghana and Nigeria. The thesis purposely explores recent trends in the production, yield, demand and processing of agricultural commodities. Also, the study pre-empts the incidence of structural transformation by examining trends in agriculture's contribution to national income (GDP) and employment. Further, the thesis compares Ghana and Nigeria to selected Asian countries (Thailand and Vietnam) to examine the similarities and differences in the structural change process. It establishes the nature of structural change in Ghana and Nigeria and reverts to farm household use of labour for farm-level food processing as an alternative.

1.2 **Motivation**

The fact exists that, the African continent has experienced significant socio-economic transformation in the last two decades. However, for COVID-19, growth in sub-Saharan Africa (SSA) is projected to contract by about 3.2 percent. Growth is projected to recover to 3.4 percent in 2021 subject to the continued easing of restrictions and avoiding a worse case of the pandemic experienced elsewhere (International Monetary Fund (IMF), 2020). Africa's success is seen in the decline of poverty, infant mortality and increased access to education (e.g. McKay, 2013; Page & Shimeles, 2015). Diao et al., (2017) observed that the driving force for African growth has been both productivity growth and the movement of labour from the agricultural sector to productive non-farm[1] sectors –as explained in the structural change theory (J. R. Harris & Todaro, 1970; Lewis, 1954). Simply, the shifting of economic agents' interest in productive activities alongside economic growth leads to the transformation of economic structures (e.g. Xu, 1994; Yao, 2000) and rural-urban migration (e.g. Diao et al., 2019). The sub-region has largely been lacking in empirical work on structural change.

Studying the nature of structural transformation in the labour market of SSA enables a better understanding of the development process. This is important as, in developing countries, the challenge for policymakers is not primarily to raise growth rates but rather to promote labour-intensive growth and raise the incomes of the poorest individuals (Temple, 2005).

The sub-region's economic growth is also observed with a growing population and workforce. The region's workforce is growing at about 3 percent per year – more rapidly than in any other region of the world. Furthermore, Africa's working-age population is expected to soar by 450 million people, or close to 70 percent of the total adult population, by 2035 (World Bank, 2017). This means that a high number of young Africans continue to enter the labour market each year, with vacant quality job positions barely keeping pace (Abdychev et al., 2018).

There are both opportunities and challenges to the region. There is the potential for stronger domestic markets through increased domestic demand. With favourable investment incentives and opportunities for viable employment equivalent to the rate of labour force expansion will result in rapid transformation and income growth in African economies (Filmer & Fox, 2014; Page & Shimeles, 2015). Otherwise, high levels of under- and unemployment and related economic migration are bound to continue unabated in the years ahead.

[1] Non-farm is the same as non-agriculture in this dissertation.

Further, a consequence of the increasing population especially in the agricultural sector is a strain on other means of production. In the case of farm households, for instance, the land-man ratio declines as the household family size increases. At a given threshold, the use of full labour in the household's agricultural production results in low marginal labour productivity. Households would need to diversify their economic activity to sectors that make more efficient use of their labour, but non-agricultural labour markets are often weak (Owoo & Lambon-Quayefio, 2018; E. Quartey & Darkwah, 2015). Nevertheless, international experience shows that intersectoral labour mobility, especially out of the traditional farm sector, has been an important condition for self-sustained economic development (e.g. see Islam & Yokota, 2008; Todaro & Smith, 2014).

Given the progress in sub-Saharan Africa, empirical cases in the transformation process are analysed for this thesis with Ghana and Nigeria as case studies. Even though Nigeria is much more diverse due to its population and land size, both countries share similar traits of agro-climatic, political, and economic similarities. Both have experienced premature de-industrialisation, unstable political regimes, and participation in structural adjustment programmes, and are largely tropical countries. The changing economic and labour structure in these economies gives a good case scenario to understand the realisation of holistic growth through labour prioritization (Chenaf-Nicet & Asse, 2021; Newfarmer et al., 2018).

1.3 Research questions and objectives

The thesis examines the changing economic and labour structure in Sub-Saharan Africa using Ghana and Nigeria as study cases. The thesis answers the following questions that lead to the objectives.

(1) How relevant has the agricultural sector been over a three medium-term period?

As farm-nonfarm labour mobility is the focus of this thesis, it is necessary to assess the economic significance of the agricultural sector in SSA. Agriculture continues to have a pivotal role in African economies, employing more than half (53%) of the total workforce and contributing about 14 percent of the region's gross domestic product (GDP) (World Bank, 2020). The section looks at yields, production, domestic demand and use of key commodities as well as income and employment generated from the sector in Nigeria and Ghana. The objective here is to explore the current relevance of the agriculture sector in a changing world.

(2) How does the changing economic structures in the Sub-Saharan Africa region compare to the South East Asian region?

North East and South East Asia have experienced sustained economic growth in recent decades. The common characteristics of countries in this region are that they have transitioned from a poor-agrarian to a high-middle-income economy with a strong industrial/manufacturing base. Africa's recent economic growth has bypassed industrialisation as a driver of growth and jobs (Sumner, 2018; World Bank, 2014). The differences and similarities of sector-driven changes between the two regional economic blocs give a better understanding of how growth-targeting policies could be implemented and improved in the sub-region. The objective of this section is to comparatively analyse the structural transformation process in sub-Saharan Africa (SSA) and South-East Asia (SEA) economies.

(3) What is the nature of the labour market in the sub-region?

Theoretically, the agricultural (traditional) sector declines while the nonfarm (often referred to as modern) sector expand with economic growth (e.g. (Lewis, 1954). The non-farm sector, however, is extremely diverse with respect to capacity to employ, skill set, type of employment, and wage levels. In some cases, economic activities in the modern sector may be traditional, given the nature of the operation. For instance, small-scale artisanal manufacturing such as blacksmithing may diminish with economic growth. Also, jobs created in the nonfarm sector in recent years could be concentrated in informal activities which are prone to vulnerabilities in the labour market (Filmer & Fox, 2014; International Labour Organization, 2014). Therefore, an in-depth analysis of the sub-sectors of the major economic sectors will present a clear overview of the labour market situation in Ghana and Nigeria. This section therefore analyses the nature of the labour market in Ghana and Nigeria.

(4) What influence does economic development and land constraints have on farm household food processing activities?

Although theory suggests migration of farm labour to the modern sector in a two-sector analysis of structural transformation, not all labour would be able to migrate. Even those that are successful at migrating, the modern industrial sector may not sufficiently employ all due to the under-paced

growth of formal employment (Page & Shimeles, 2015). On the other hand, the region faces growing land scarcity resulting from population pressure (Jayne et al., 2017). This means that per capita agricultural land is declining, creating a labour surplus on farms. To diversify labour use, farm households might increase on-farm processing activities. This section identifies the conditions under which such processing becomes more attractive to farm households. The general objective, therefore, is to identify the factors that determine the likelihood of farm household labour participation in farm processing and the extent of use of household labour.

1.4 Methodology

The question of the role of the agricultural sector was answered using time series data and cross-sectional data in a descriptive analysis. The time-series data comprised the World Bank's World Development Indicator (WDI), the Food and Agriculture Organization (FAO) of the United Nations, the Ghana Statistical Service (GSS), and the Central Bank of Nigeria database. The cross-sectional data is obtained from the Ghana Living Standard Survey (GLSS) and the General Household Survey (GHS) data of Nigeria.

Similarly, research question 2 (Asia-Africa comparison) is addressed using time-series data on the economies of Ghana, Nigeria, Vietnam, and Thailand from the World Development Indicators. Tables, charts and diagrams are used to represent the results obtained from analyses. A time-series trend of sectoral productivity, sectoral contribution to national income, the sectoral share of employment, and differences between the share of agriculture in employment and valued addition is undertaken for the economies of these selected countries to compare similarities and divergences.

Research question 3 (i.e., nature of the labour market in Ghana and Nigeria) is analysed by using two waves of the Ghana Living Standard Survey (GLSS) –GLSS6 (2012/13), GLSS7 (2016/17), and Nigeria's General Household Survey (GHS) –GHS2 (2012/13), GHS3 (2015/2016). Descriptive statistical methods of data analysis were used and presented in tables and charts to illustrate dominant economic activities, skill-set, types of employment, and wage levels.

Finally, a Heckman two-stage econometric model is used to answer research question 4. We used two waves of the Ghana Living Standard Survey (GLSS 6&7) to determine if economic development and land scarcity will determine the probability of a farm household's participation in food processing and the share of household labour committed to the processing activity.

1.5 Structure of thesis

The Structure of the thesis is in five chapters. The first chapter is the introductory chapter which present's the background, motivation, research questions, and objectives. The second chapter presents an overview of the importance of the agricultural sector as a basis of the economic development in Sub-Saharan Africa. The third chapter comparatively analyses structural transformation processes in Sub-Saharan Africa and East Asia. The fourth chapter analyses the labour market structure of economic sectors due to structural transformation. The fifth chapter examines the determinants and extent of farm household labour participation in agro-processing.

1.6 Limitation and outlook

Although nationally representative surveys and time series data were used in most parts of the thesis, the study focused on only two countries from sub-Saharan Africa out of the 67 states. A much broader generalisation could be made if this study is replicated for other SSA countries.

Most parts of the study used descriptive statistics with limited empirical testing of statistical trends. This could be attained if a series of cross-sectional data from more than two countries are used to construct a pseudo-panel dataset for the analysis.

1.7 References

Abdychev, A., Alonso, C., Alper, E., Desruelle, D., Kothari, S., Liu, Y., Mathilde, Perinet, Sidra, R., Schimmelpfennig, A., & Sharma, P. (2018). *The Future of Work in Sub-Saharan Africa* (No. 18/18; p. 59). International Monetary Fund. https://www.elibrary.imf.org/

Chenaf-Nicet, D., & Asse, B. (2021). *Premature deindustrialization and development without factories Are services sectors a new path for the development of sub-Saharan African countries?* https://doi.org/10.21203/rs.3.rs-379649/v1

Diao, X., Harttgen, K., & McMillan, M. (2017). The Changing Structure of Africa's Economies. *The World Bank Economic Review*, *31*(2), 412–433. https://doi.org/10.1093/wber/lhw070

Diao, X., Magalhaes, E., & Silver, J. (2019). Cities and rural transformation: A spatial analysis of rural livelihoods in Ghana. *World Development*, *121*, 141–157. https://doi.org/10.1016/j.worlddev.2019.05.001

Filmer, D., & Fox, L. (2014). *Youth Employment in Sub-Saharan Africa*. The World Bank. https://doi.org/10.1596/978-1-4648-0107-5

Harris, J. R., & Todaro, M. P. (1970). Migration, Unemployment and Development: A Two-Sector Analysis. *The American Economic Review*, *60*(1), 126–142.

International Labour Organization (Ed.). (2014). *Developing with jobs* (2. ed. rev). ILO.

International Monetary Fund (IMF). (2020, June 29). *Sub-Saharan Africa Regional Economic Outlook: A Cautious Reopening*. IMF. https://www.imf.org/en/Publications/REO/SSA/Issues/2020/06/29/sreo0629

Islam, N., & Yokota, K. (2008). Lewis Growth Model and China's Industrialization. *Asian Economic Journal*, *22*(4), 359–396. https://doi.org/10.1111/j.1467-8381.2008.00282.x

Jayne, T., Yeboah, F. K., & Henry, C. (2017). *The future of work in African agriculture: Trends and drivers of change* (Research Department Working Paper No. 25). International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms_624872.pdf

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *The Manchester School of Economics*, *22*(2), 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

McKay, A. (2013). Growth and Poverty Reduction in Africa in the Last Two Decades: Evidence from an AERC Growth-Poverty Project and Beyond. *Journal of African Economies*, *22*(suppl_1), 49–76. https://doi.org/10.1093/jae/ejs029

Newfarmer, R. S., Tarp, F., & Page, J. (Eds.). (2018). *Industries without smokestacks: Industrialization in Africa reconsidered*. Oxford University Press.

Owoo, N. S., & Lambon-Quayefio, M. P. (2018). The Agro-Processing Industry and its Potential for Structural Transformation of the Ghanaian Economy. In R. Newfarmer, J. Page, & F. Tarp (Eds.), *Industries without Smokestacks: Industrialization in Africa Reconsidered* (pp. 1–23). Oxford University Press. https://www.oxfordscholarship.com/view/10.1093/oso/9780198821885.001.0001/oso-9780198821885

Page, J., & Shimeles, A. (2015). Aid, Employment and Poverty Reduction in Africa. *African Development Review*, *27*(S1), 17–30. https://doi.org/10.1111/1467-8268.12136

Quartey, E., & Darkwah, S. (2015). Factors affecting the use of modern technologies in Agro processing in Ghana. *Academia Journal of Agricultural Research*, *3*(7), 99–115. https://doi.org/DOI: 10.15413/ajar.2015.0135

Sumner, A. (2018). *Development and Distribution: Structural Change in South East Asia*. Oxford University Press.

Temple, J. (2005). Dual Economy Models: A Primer for Growth Economists. *The Manchester School*, *73*(4), 435–478. https://doi.org/10.1111/j.1467-9957.2005.00454.x

Todaro, M. P., & Smith, S. C. (2014). *Economic Development, 12th edition* (12 edition). Trans-Atlantic Publications.

World Bank. (2014). *Africa's Pulse: Decades of Sustained Growth is Transforming Africa's Economies.* World Bank. http://www.worldbank.org/en/region/afr/publication/africas-pulsedecades-of-sustained-growth-is-transforming-africas-economies

World Bank. (2017). *The Africa competitiveness report 2017: Addressing Africa's demographic dividend.* World Economic Forum. http://www3.weforum.org/docs/WEF_ACR_2017.pdf

World Bank. (2020, June 20). *World Development Indicators | DataBank*. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators

Xu, Y. (1994). Trade liberalization in China: A CGE model with Lewis' rural surplus labor. *China Economic Review*, *5*(2), 205–219. https://doi.org/10.1016/1043-951X(94)90024-8

Yao, S. (2000). How Important is Agriculture in China's Economic Growth? *Oxford Development Studies*, *28*(1), 33–49. https://doi.org/10.1080/713688306

Chapter 2
An overview and importance of the agricultural sector in Sub-Saharan Africa: The case of Ghana and Nigeria

Abstract.

The African sub-region heavily depends on the agricultural sector as a source of livelihood. Traditionally, it is a source of employment and income for most low-income earners. We research the production, yield, demand and international trade flow of major agricultural commodities of crops and livestock. Also, we seek to establish trends in the macroeconomic contribution of the sector. A time series data analysis exhibits that Ghana performed better in yield than Nigeria. Except for cocoa beans and their products, palm kernel cake and oil, and dried cassava and cassava flour, Ghana and Nigeria are generally net importers of agricultural commodities. Agriculture's contribution to gross domestic product (GDP) and employment successively declined in both countries. A subsector analysis revealed that the crop subsector contributes most of agriculture's value addition to the GDP. Further, potential job creation is identified mainly in cassava and maize (as in food crops) and cocoa and oil palm (as in cash crops) production.

Keywords: Agriculture, Ghana, Nigeria, crops, livestock, GDP, employment

2.1 Introduction

Agriculture has been the traditional source of employment and income in the African sub-region. While the importance of the sector to the rural population is well documented, recent surveys suggest that agriculture is also the primary source of livelihood for 10% to 20% of urban households (OECD & FAO, 2016; Yeboah &

Jayne, 2015). The high level of employment provided by the sector mostly comes from labour-intensive raw agricultural production (Hall & House, 1994) in contrast to an appreciable level of agriculture mechanisation (Daum & Birner, 2020). Increased job opportunities in the agricultural sector usually correlate with an adequate flow of income. As a result, various policy recommendations for poverty alleviation and food security have often focused on the agriculture sector (e.g. Adeyemo et al., 2016; Openshaw, 2010).

Of recent importance is the increased demand for food due to population growth which calls for increased production. The Sub-Saharan Africa (SSA) region accounts for about 1 billion people, approximately 14% of the global population (World Bank, 2020). Although the projection for food production is to increase by 60% by 2050 (Popp et al., 2014), the Sub-Saharan Africa (SSA) region is troubled by food insecurity issues. Although undernutrition is still an issue in SSA, a recent report showed a decline. There was a reduction in the value of global hunger index score (about 30 recorded in 2016 as compared to 48 in 1992) with a considerable inter-country variation. In Ghana, a moderate hunger index (13.9) was experienced in 2016 whiles a serious hunger index (25.5) was recorded for Nigeria at the same time (The International Food Policy Research Institute (IFPRI), 2017). To mitigate food security issues in the sub-region, literature suggest the promotion of agricultural production that has trade potential (OECD & FAO, 2016). This to a large extent will contribute to economic development.

The role of the agricultural sector in the economic development process is conceptualised by Lewis (1954) who explains the migration of labour from a less productive traditional (agricultural) sector to a more productive modern (industrial) sector in the two-sector model. The Lewis model of intersectoral structural change well describes the development of intersectoral labour market structure in almost all industrialising countries in the sense that employment in the agricultural sector inevitably shrinks relative to other growing sectors of the economy. This transformation process is sustained if; a) the non-agricultural sector's labour demand keeps growing, and b) the agricultural sector can provide a surplus of workers with a minimum skill level to meet this demand. In the case of SSA, however, non-farm economic growth has been slow since the era of independence as compared to most parts of Asia. Its non-farm sector is therefore not able to absorb the labour surplus generated by rural population growth, land scarcity and the labour-saving technical progress in farming, creating rising rural underemployment at least outside the peak working seasons (Engel et al., 2017; Rao, 2006), giving rise to alternative strategies to

use this labour surplus, such as on-farm processing. Processing might both absorb surpluses in labour as well as product residues. Nevertheless, the agricultural sector plays much more significant role in the economies of the sub-region.

The purpose of this section is to provide a factual background to this issue for Ghana and Nigeria by looking at recent trends in production and factor use of their agricultural biomass production sectors. Also, we acknowledge the sector's reaction to economic growth leading to structural transformation by examining its contribution to national income (GDP) and employment over three consecutive medium terms. In the early section of the analysis presents trends in production, yield, consumption and processing of agro-products for purposely selected commodity groups of food crops, cash crops, and livestock (e.g. see OECD & FAO, 2016). National income (GDP) and employment contribution from the agricultural sector are discussed in section 2.3. Section 2.3 is a summary and conclusion on the finding.

2.2 Trends in agricultural production, yield, consumption, and processing in Ghana and Nigeria

This section highlights the importance of the biomass sector with a detailed discussion of its sub-sectors; food crops, cash crops, and livestock in Ghana and Nigeria. The definition of cash crops and food crops may differ for some crop categories. However, a cross-cutting crop type exists for both countries. One important aspect is that crops considered here are important household crops (e.g. cassava) with appreciable economic value (e.g. cocoa) and energy potential (e.g. oil palm) (i.e. >3Tj kg-1) if converted to biomass energy (Table 2.1). The livestock discussed have significant energy potential (Table 2.2).

Table 2.1: Produce to energy ratio PRR and energy potential of selected crop commodities for Ghana

	Crop					
	Sorghum (Stalk)	Maize (Stalk)	Millet (Stalk)	Rice Paddy (Straw)	Oil palm (EFB)	Cocoa (Husk)
Production quantity (10^3 tonnes)[a]	324.00	1872.00	219.00	492.00	2004.00	632.00
Product-to-residue ratio (PRR)	1.40	1.40	3.00	1.50	0.25	1.00
Calculated residue generated (10^3 t)	453.60	2620.80	657.00	738.00	501.00	632.00
Lower heating value ($TJx10^{-5}kg^{-1}$)	1.70	1.55	1.55	1.56	1.55	1.55
Energy potential ($TJ\ kg^{-1}$)	7.71	40.57	10.19	11.48	11.48	9.78

EFB=Empty Fruit Bunch; a=annual production in 2010
Source: Mohammed et al., (2013)

Subsequently, the discussion centres around the production, yield, processing, and demand/consumption trends. The purpose here is to provide information on the dynamics of the selected commodities within medium-term intervals to track their performances. The discussion covers the period of three four-year averages (2005-2008, 2009-2012, and 2013-2016) are used to reflect a medium-term performance in line with the broad national strategic framework of development agenda such as the Ghana Shared Growth and Development Agenda (GSGDA), and Nigeria's vision 2020 which are medium-term plans. For instance, the years 2013-2016 fall within the medium-term agriculture sector investment plan (METASIP II) of Ghana (Ministry of Food and Agriculture (MoFA), 2015). Therefore, the choice of the years helps in future deduction of the possible impact of government policies as well as other interventions from multinational institutions on the sector since development partners usually align their programmes to the government's plans.

Table 2.2: Livestock's total energy and nutrient potential

Livestock	Total energy potential (TJ)	N (mg/kg)	P_2O_5 (mg/kg)	K_2O (mg/kg)
Cattle	17.67	5.45	1.85	3.65
Goats	9.92			
Pigs	1.72	6.45	3.55	5.45
Sheep	7.68	11.50	3.50	10.85
Chickens	10.60	14.95	7.15	3.50

Source: (Cravotta, 1997; Jingura & Matengaifa, 2009; Mohammed et al., 2013)

2.2.1 **Food crops**

Production, yield, consumption, and processing

The global food price crisis in 2008 made the world once again take a critical look at the food crop sub-sectors competing for use in the biomass sector (Mittal, 2009). The extent to which Africa contributed to this crisis in this sense could be minimal since most African countries are net food importers. Nevertheless, domestically produced food crops in Africa are also important biomass feedstock and are internationally traded commodities.

Food crops discussed hereafter are in respective order are: cassava, sweet sorghum, and maize/corn. They are particularly high-energy crops and produce adequate organic matter for other biomass value chain development (Edenhofer et al., 2012). They grow well on marginal/degraded agricultural lands with good crop management practices.

Cassava performs well in broader ecological zones and has relatively low input costs compared to other staples such as maize. Moreover, it tolerates poor soil, adverse weather, pests and diseases. It is a "safe deposit" for most farmers since matured plants can be kept on the ground for a while and harvested when needed (Nweke, 2004). It is an ideal commodity for smallholder farmers and policy mitigation against food insecurity. Cassava is grown on both subsistence and commercial scale in Ghana and Nigeria, with the latter being the largest producer. Estimates from the FAO report indicate that Nigeria, the largest producer of cassava in Africa, contributes about 35 percent while the second-largest producer, Ghana, contributes about 12 percent of production (Food and Agriculture Organization(FAO), 2018). On average, Nigeria produces more than half as much as Ghana over the three medium terms (Table 2.3).

However, on a per capita basis from current average estimates, Ghana is the biggest producer of about 631kg per person compared to Nigeria (about 305kg). In line, Ghana's cassava subsector has been thriving more than Nigeria's over the years. Ghana exceeded Nigeria in yield attainment by about 104.69 hg/ha on average between 2013 and 2016. Apart from high consumer demand for cassava in rural and urban households, growth in tuber yield, as well as production, has been driven by the International Institute of Tropical Agriculture (IITA's) new high-yielding Tropical Manioc Selection (TMS) varieties and the Africa-wide biological control program that averted the devastating cassava mealybug epidemic (Chauvin et al., 2012; Nweke, 2004). Sector-specific programmes such as the president's special initiatives (PSI) on cassava in 2001 for Ghana and 2002 for Nigeria. The continued research into improved cassava varieties has contributed to the sector's performance (FMARD, 2016). It appears that these programmes stimulated initial interest in cassava production and utilisation.

Table 2.3: Cassava cultivation in Ghana and Nigeria 2005-2016

		2005-2008	2009-2012	2013-2016
Ghana	Production (10^3 t)	10193.51	13630.71	17199.78
	Production per capita (kg)	454.32	548.69	630.51
	Yield (10^3 hg/ha)	128.07	155.00	190.07
Nigeria	Production (10^3 t)	43819.50	44123.99	54628.25
	Production per capita (kg)	303.19	273.71	305.11
	Yield (10^3 hg/ha)	114.98	107.88	85.38

t= tonnes; hg=hectogram=100 grams; ha=hectares

Source: FAO, FAOSTAT Production (crops) (2018). Accessed: 24.01.2018. URL: http://www.fao.org/faostat/en/#data/QC

Cassava is one of the multi-product crops for consumption and industrial purposes. Table 2.4 shows the current demand and achievable demand in the short-to-medium term (1-5 years) of cassava products as estimated by Kleih et al., (2013) in a scoping and market opportunity study for Ghana. Based on their estimates on available data, demand will be about 37,500 metric tonnes per annum.

Table 2.4: Current and projected demand for cassava-based products in the short to medium term, in Ghana

Products	**Current market (t)**	**Achievable demand**	**Medium-term potential (mt/yr)**
HQCF in wheat total			10,000
HQCF in bakeries	Limited	1,000	5,000
HQCF use in institutions (e.g., schools)	Limited	1,000	5,000
HQCF in biscuits	Limited	200-300	1,000-2,000
HQCF in paperboard		500	2,000
Industrial-grade flour in plywood	2,000	2,000	4,000
Chips for animal feed	Limited	2,000	10,000
Total			**~37,500**

Source: Kleih et al., 2013

In Nigeria, similar studies Naziri et al., (2013) identified a particularly high demand for cassava products mainly in a form of high-quality cassava flour (HQCF), instant odourless fufu, garri, starch, sugar syrup and sweeteners, chips (–for domestic livestock and export), ethanol/biofuels, and beer. Table 2.5 shows the current demand and achievable demand in the short to medium term (1-5 years from January 2014) for these cassava products. In all, an approximated amount of about 755,000t per annum of fresh cassava roots (FCR) is expected to be demanded within the medium term.

Table 2.5: Current and projected achievable demand for cassava-based in the short to medium term, Nigeria

Products	Current market (t)	Achievable demand	Medium-term potential in FCR* equivalents (t/yr)
HQCF in bread	2,500	40,000t	160,000
HQCF in biscuits	0	16,500t	66,000
HQCF in snacks	12,500	12,500t	50,000
HQCF in paperboard	0	6,000t	24,000
Instant fufu	500		
Package garri	50-100	100t	430
Cassava starch	14,00	25,000t	125,000
Sugar syrup and sweeteners		2.2 million t	
Chips for fish feed	Negligible	23,000t	74,000
Ethanol industrial		Industrial alcohol = 20 million litres	140,845
Ethanol cooking		Home-cooking ~7.5 million litres	53,000
Cassava-based beer		15,400 t	61,600
Total			**~755,000**

** Fresh cassava roots (FCR) = Cassava grits adjusted to 14% moisture or equivalent in wet-cake (~40% moisture)*

Source: Naziri et al., (2013)

The food component of the commodity account refers to the total amount of the commodity available for human consumption during the year (Food and Agriculture Organization (FAO), 2018). Demand for cassava for food and feed in Ghana increased consecutively over the medium-term intervals (Table 2.6). Most uses of cassava and

its products were for human consumption. A similar increasing trend in cassava use for food and feed occurs in Nigeria. In Nigeria, the leading source of use of cassava is feed. Generally, on average, cassava usage for food per person in Ghana has been high over the period as compared to Nigeria.

Table 2.6: Cassava and products* use, 2005 to 2016, Ghana and Nigeria

	Ghana			Nigeria		
	2005/08	**2009/12**	**2013/16**	**2005/08**	**2009/12**	**2013/16**
Food (10^3 tonnes)	4670.25	5268.75	6213.50	17050.50	18081.25	21726.75
Food per capita (kg)	205.92	210.05	225.61	117.93	112.50	121.50
Feed (10^3 tonnes)	2050.00	3457.50	4346.00	21734.50	23034.00	28698.00
Seed (10^3 tonnes)	-	-	-	-	-	-
Other uses (10^3 tonnes)	400.25	808.25	1468.75	-	-	-

**this includes: fresh cassava, cassava flour, tapioca, dried cassava, and cassava starch*
Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018. URL: http://www.fao.org/faostat/en/#data/QC

Further the usefulness of cassava can be found for the entire plant. However, the root tuber and leaves are the most important sources of use. The root tuber is mostly processed at various scales for either domestic or industrial consumption. In Ghana for instance, harvested root food products such as boiled or pounded cassava (Fufu), Gari (roasted fermented cassava), Agbelima (fermented cassava mash), Kokonte (dried chips), and other industrial products (such as starch) are produced (Kleih et al., 2013). Aside from this, cassava peelings and tubers are useful as animal feed and substrates for mushroom production. In Ghana, starch is perhaps the most industrialised output from cassava. The Ayensu Starch Company ltd (ASCo) with a production capacity of 22,000 metric tonnes per annum was established as part of the special initiatives. The company currently employs 60 people in its core processing activities. There are other lower-capacity starch producers in the country. Second, to this product, is perhaps *gari* producers who are much concentrated in cassava-producing regions of Ghana. The majority of which are small-scale producers but provide adequate income and employment to women especially.

Nigeria being a leading producer of cassava has perhaps the highest concentration of cassava agro-processors. There are several companies with high visibility on the

international market. Examples are Psaltry Farm, Crest Agro Products Limited, Nigerian Starch Mills Limited, Niji Foods, Lentus Foods and Agro Ltd, and others in Nigeria. Their contributions to the biomass value web are diverse. Psaltry Farm for instance, with a capacity of 50 metric tonnes per day, employs 300 permanent and temporal staff and works with more than 2,000 registered and unregistered out-growers. Crest Agro Products Ltd provides employment to 3,500 people across the entire cassava value chain and produces a capacity of 100,000 metric tonnes of starch per annum (for further information see the webpage of the respective companies). Small-scale processors are numerous and scattered across cassava-growing regions in Nigeria.

There are no records of international trade volumes in fresh cassava tubers. This is because fresh cassava constitutes a major component of domestic food staples. Available trade data on cassava products show that for the three consecutive average year period, Ghana and Nigeria have been net exporters of dried cassava and cassava flour (Table 2.7). Concerning cassava starch, both countries are on average net importers. This observation indicates a shortfall in domestic cassava starch processing in meeting domestic industrial demand. Cassava starch is a useful intermediate industrial raw material with a wide range of industrial applications. It is useful in the food processing industry (e.g., as a binder, and thickener), the textile industry and the adhesive industry (e.g., paints).

Table 2.7: Net export volume of cassava products in Ghana and Nigeria

	Items in tonnes	2005/08	2009/12	2013/16
Ghana	Cassava dried	3189.75	6.25	1659.00
	Flour, cassava	805.50	1446.25	1568.00
	Starch, cassava	-88.75	-306.75	-211.00
Nigeria	Cassava dried			451.17
	Flour, cassava	1566.25	608.50	393.25
	Starch, cassava			-863.67

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018. http://www.fao.org/faostat/en/#data/TP

Sorghum is a drought-resistant food crop mainly grown in savannah agroecological regions. It is traditionally cultivated for food and beverages and used as a local roofing material. Its leaves can serve as fodder for farm animals. Apart from roofing, its stalks

are used for fencing, staking, weaving baskets, mats and fuel. It also has a use for bioethanol production feedstock (Angelucci, 2013; Ben-Iwo et al., 2016). Production activities of sorghum have been fluctuating over the three medium terms. In Ghana, production per capita and yield gain are observed between 2009 and 2012 medium-term. The partnership between Guinness Ghana Ltd and TechnoServe (2006-2011) perhaps accounts for this. The partnership entailed closer support to farmers in terms of agronomic practices in the cultivation of malting sorghum varieties for an assured market. On the part of the government, Capital Venture Trust Funds that provided credit to the farmers were also set up (Angelucci, 2013).

In Nigeria, production and yield declined in all the medium-term year intervals after an initial first medium-term (2005/08) value of 64.76 kg and 12.48 hg/ha respectively (Table 2.8). Apart from climatic factors, the decline could be attributed to increased insecurity in most parts of producing region of Nigeria starting in 2009. Gourichon (2013) attributed the decline, especially in 2009, to producers switching to a more profitable crop despite a good potential demand from the brewery industry.

Table 2.8: Sorghum cultivation in Ghana and Nigeria 2006-2016

		2005-2008	2009-2012	2013-2016
Ghana	Production (10^3 t)	276.45	310.51	252.00
	Production per capita (kg)	12.36	12.55	9.25
	Yield (10^3 hg/ha)	9.82	12.47	11.07
Nigeria	Production (10^3 t)	9355.00	5986.85	6531.98
	Production per capita (kg)	64.76	37.26	36.45
	Yield (10^3 hg/ha)	12.48	12.30	11.40

Source: FAO, FAOSTAT Production (crops) (2018). Accessed: 24.01.2018. URL: http://www.fao.org/faostat/en/#data/QC

Table 2.9 shows that sorghum is least consumed as food in Ghana when compared to Nigeria. Although there are inadequate records on sorghum use as feed, there has been a reported incidence of sorghum use as feed for farm animals (e.g., see Angelucci, 2013). Perhaps, sorghum demand in this sense is not captured in national reporting due to the quantum of use or other unexplained reason(s). The consumption of sorghum and products (Sorghum, Flour, and Bran) as food per capita in Nigeria has been more than four times greater than that of Ghana. Even though the volume of sorghum used for seeds has been decreasing over the three medium terms in Nigeria, an increasingly

large proportion of sorghum in Nigeria is used as seeds as compared to Ghana. This correlates with higher production volumes in Nigeria and draws attention to the potential viability of a seed production market.

Table 2.9: Sorghum and products[a] use, 2005 to 2016, Ghana and Nigeria

	Ghana			Nigeria		
	2005/08	**2009/12**	**2013/16**	**2005/08**	**2009/12**	**2013/16**
Food (10^3 tonnes)	183.50	205.25	168.75	5603.75	5586.00	5880.75
Food per capita (kg)	8.09	8.18	6.13	38.76	34.74	32.89
Feed (10^3 tonnes)	-	-	10.00	1643.00	736.50	398.75
Seed (10^3 tonnes)	2.75	2.25	7.25	137.25	104.25	105.50
Other uses (10^3 tonnes)	-	-	-	-	-	-

[a] *including sorghum flour, sorghum bran*

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018.

The traditional processing of sorghum into paste and flour for food is still dominant at the household level in both countries. There are in existence a few non-conventional processors of sorghum in both countries. A recent major investment made by Northern Nigeria Flour Mills' plc is the largest in sub-Saharan Africa. The plant has an installed capacity of 100,000 metric tonnes per annum, creating over 40,000 new jobs along the value chain (Ajakaiye, 2017). In Ghana, the largest processor is the Guinness Ghana Breweries Limited (GGBL). The company has about 48% of its current raw material in brewing from sorghum with a capacity of taking in 4000 metric tonnes per annum (Angelucci, 2013). Comparatively, a greater proportion of sorghum is processed in Ghana than in Nigeria although Nigeria processes a greater volume of its annual sorghum produced (Table 2.10). This provides an indication that sizeable portions of the domestically produced sorghum are used in its raw form and or used in a semi-processed form.

Table 2.10: Sorghum and products processed in Ghana and Nigeria (2005-2016)

		2005-2008	2009-2012	2013-2016
Ghana	Total supply (10^3 tonnes)	278.75	310.50	252.25
	Processed quantity (10^3 tonnes)	46.75	52.25	42.50
	Percent of the total supply	16.77	16.83	16.85
Nigeria	Total supply (10^3 tonnes)	8611.50	7367.25	6936.00
	Processed quantity (10^3 tonnes)	176.75	176.50	172.75
	Percent of the total supply	2.05	2.40	2.49

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018.
URL:http://www.fao.org/faostat/en/#data/QC

Throughout the average year intervals, Ghana and Nigeria have had a trade deficit in Sorghum. Table 2.11 shows that per the size of Nigeria, there are greater volumes of sorghum demanded. International trade data for other products of sorghum are unavailable. Perhaps all processed sorghum products are used to satisfy domestic consumption.

Table 2.11: Net export volume of sorghum in Ghana and Nigeria

	Items in tonnes	2005/08	2009/12	2013/16
Ghana	Sorghum	-2149.50	-30.00	-21.00
Nigeria	Sorghum	-6329.00	-13094.25	4765.75

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018.
http://www.fao.org/faostat/en/#data/TP

Maize is one of the common staple foods in Ghana and Nigeria. It is also one of the feedstocks for liquid biofuel production. In the right environment, maize yields about 7 to 11 tonnes per hectare and its ethanol yield can amount to 769.89 gallons/ha of corn (Elbehri et al., 2013). Further, maize is widely cultivated across all the agroecological zones of both countries on commercial or subsistence levels. The production of maize increased to about an average of 71 kg per capita (2009 and 2012) from about 56 kg per capita. It decreased in the subsequent medium term to about 64 kg per capita (2013-2016) (Table 2.12). The yield on the other hand increased throughout the medium terms under review. Perhaps to some extent, part of this could be attributed to the Food Development Project (FDP) (2000-2008) and the subsequent rollout of the Fertilizer Subsidy Programme (FSP) in 2008. In Nigeria, maize

production increased throughout the three medium terms. However, yield in the recent medium-term maize production declined by about 14 percent from the previous term. According to Nigeria's policy, maize continues to be a priority crop under the Agriculture Promotion Policy (APP) (2016-2020) after the Agricultural Transformation Agenda (ATA) (2011-2015)(FMARD, 2016). These declines could be due to bottlenecks in the approach to the policy dictates.

One phenomenal observation in table 2.12 is that yield per hectare in Ghana was significantly higher than that of Nigeria in the present medium-term (2013-2016). On a per-capita basis, Ghana obtained a consistent increase and higher value in production than Nigeria.

Table 2.12: Maize production in Ghana and Nigeria 2006-2016

		2005-2008	2009-2012	2013-2016
Ghana	Production (10^3 tonnes)	1262.42	1781.29	1735.01
	Production per capita (kg)	56.24	71.73	63.67
	Yield (10^3 hg/ha)	15.85	17.75	18.31
Nigeria	Production (10^3 tonnes)	6826.50	8152.12	9864.43
	Production per capita (kg)	47.16	50.64	55.08
	Yield (10^3 hg/ha)	17.85	17.96	15.49

Source: FAO, FAOSTAT Production (crops) (2018). Accessed: 24.01.2018. URL:http://www.fao.org/faostat/en/#data/QC

The use of maize as food and seed decreased on average across the three medium-terms for Ghana but not Nigeria (Table 2.13). In the current medium-term (2013/16), the use of maize for food per capita and seed in Ghana decreased by about 14 and 2 percent respectively. In Nigeria, there was a growth of about 14 percent. There has been increasing use of maize for feed and other use in both countries. This is perhaps in response to demand from the growing poultry industry.

Table 2.13: Maize and products[a] use, 2005 to 2016, Ghana and Nigeria

	Ghana			Nigeria		
	2005/08	**2009/12**	**2013/16**	**2005/08**	**2009/12**	**2013/16**
Food (10^3 tonnes)	509.25	682.00	644.25	3603.50	4757.75	10642.25
Food per capita (kg)	22.45	27.17	23.39	23.03	27.32	31.12
Feed (10^3 tonnes)	601.50	819.50	831.00	2050.00	2578.25	3291.75
Seed (10^3 tonnes)	25.50	30.75	30.00	94.25	128.50	128.50
Other uses (10^3 tonnes)	1.15	1.00	2.50	25.25	34.00	56.75

[a]this includes Maize, maize germ, maize flour, maize bran, maize gluten, maize starch, and feed meal
Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018.
URL:http://www.fao.org/faostat/en/#data/QC

Nigerian Eagle Flour Mill which has a product range of maize grits, and cornflour is one of the big maize millers in Nigeria. The mill has a potential output of 850 metric tonnes per day. In Ghana, Premium Foods Ltd is one of the few industrial maize processors. Their maize products are maize grits, corn soy-blend (CSB) (80% maize and 20% soybean fortified with vitamins), maize meal, and maize flour. The company has an annual production capacity of 47,520 metric tonnes but currently produces 30,000 metric tonnes of maize annually. About 200 workforces (both permanent and casual labourers) are employed by the firm. Another important processor is Yedent Agro-Processing which employs 50 permanent staff with an annual production capacity of 2,160 Metric tonnes. The company produces CSB, maize grit and maize meal.

As far as international trade in maze and maize products is concerned, Ghana and Nigeria are net importers of maize and maize oil over the average year periods (Table 2.14). Nigeria has a trade deficit in maize flour in all the year averages whiles Ghana recorded deficit only in 2009/12. In the recent year average, Ghana imported a net value of about 101 tonnes of maize bran whiles Nigeria exported a net volume of about 343.67 tonnes of maize bran.

Table 2.14: Net export volumes of maize products, in Ghana and Nigeria

	Items in tonnes	2005/08	2009/12	2013/16
Ghana	Bran, maize	0.25		-101.25
	Flour, maize	74.25	-186.00	613.25
	Maize	-52396.00	-37391.00	-42107.00
	Oil, maize	-27.00	-16.50	-44.75
Nigeria	Bran, maize	-957.75		343.67
	Flour, maize	-383.75	-6068.50	-6465.50
	Maize	-2671.25	-609.50	-120783.75
	Oil, maize			-139.50

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018. http://www.fao.org/faostat/en/#data/TP

2.2.2 **Cash crops**

Production, yield, and consumption

Cash crops such as cotton, groundnuts, and tobacco do well in the northern savannah-transition belt, whiles cocoa, coffee, tobacco, rubber, and oil palm thrive in the southern forested belt and some parts of the transition zone. In this subsection, we select two common cash crops for Ghana and Nigeria. These are oil palm and cocoa.

Oil palm is an oil-producing plant in which its two main oils are obtained from the pulp and kernels of its fruit. Both oils are useful for food and non-food purposes. Oil palm is the fourth and third most-produced commodity in Ghana and Nigeria respectively (Food and Agriculture Organization (FAO), 2018). Production and yield of oil palm fruit in Ghana increased throughout the three medium terms (Table 2.15). The introduction of new palm plants to revamp the sector might have contributed to the success in production and yield. In particular, the President's initiatives on oil palm plantation added about 20 thousand hectares of palm plantation and the build-up of

new interest between 2003 and 2009 could be attributed to the continued performance (Ministry of Food and Agriculture (MoFA), 2011).

Table 2.15: Oil palm fruit production in Ghana and Nigeria 2006-2016

		2005-2008	2009-2012	2013-2016
Ghana	Production (10^3 tonnes)	1925.82	2107.40	2414.05
	Production per capita (kg)	86.11	84.93	88.53
	Yield (10^3 hg/ha)	59.39	57.57	70.75
Nigeria	Production (10^3 tonnes)	8450.00	8150.00	7921.99
	Production per capita (kg)	58.49	50.76	44.34
	Yield (10^3 hg/ha)	26.48	25.37	26.06

Source: FAO, FAOSTAT Production (crops) (2018). Accessed: 24.01.2018. URL:http://www.fao.org/faostat/en/#data/QC

Nigeria's production of oil palm decreased at a rate of about 3% respectively from the previous average (2009-2016). Yield per hectare increased by about 2%. Comparing the two countries on a per capita basis, Ghana has been producing more oil palm throughout the three medium terms at an increasing rate.

The two well-known commercial products of oil palm are palm oil (oil from the palm fruits) and palm kernel oil (oil from the kernels). Available data shows that the demand for palm oil as food per capita in Ghana is low compared to that of Nigeria (Table 2.16a). The current medium-term average food per capita palm oil consumption decreased by about 15 percent in Ghana whiles that of Nigeria increased by 27 percent from the previous medium-term (2009/12). Nigeria, by its production share and population size, consumes more palm oil and uses it for other purposes than Ghana.

Table 2.16a: Oil palm and products use, 2005 to 2016, Ghana and Nigeria

		Palm Oil*				
	Year	**Food (10^3 tonnes)**	**Food per capita (kg)**	**Feed (10^3 tonnes)**	**Seed (10^3 tonnes)**	**Other uses(10^3 tonnes)**
Ghana	**2005-2008**	70.50	3.11	-	-	142.75
	2009-2012	71.00	2.83	-	-	121.25
	2013-2016	66.00	2.40	-	-	212.00
Nigeria	**2005-2008**	735.00	5.60	-	-	980.00
	2009-2012	856.25	5.09	-	-	934.25
	2013-2016	1158.00	6.47	-	-	1015.50

**Palm oil = palm oil, fatty acids, fatty substance residues*
Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018.
URL:http://www.fao.org/faostat/en/#data/QC

Similarly, the quantity of palm kernel oil consumed as food is far greater in Nigeria than in Ghana (Table 2.16b). However, the consumption of palm kernel oil as food in Ghana increased by about 8 percent whiles that of Nigeria decreased by about 15 percent between 2009/12 and 2013/16 medium terms.

As with other crops (food and cash crop), several supply models also co-exist for oil palm processing, from fully integrated agro-industry oil mills companies which procure from their plantations to out-grower schemes, to small-scale producers who either sell fruit to processors or produce oil for their consumption or sale to local markets (Ofosu-Budu & Sarpong, 2013). Small-scale processors dominate in palm-producing regions. They contribute about 60 percent of Ghana's crude palm oil (CPO) (Opoku & Asante, 2018). The small-scale mills generally process up to two tonnes of fresh fruit bunch (FFB) per hour while the large-scale mills process from 10 to 60 tonnes of FFB per hour (Poku, 2002). In Ghana, the large-scale plantation-oil millers are the Ghana Oil Palm Development Company (22,352ha, and 60 tonnes/hour milling capacity),

Twifo Oil Palm Plantation Limited (5,924ha, and 30 tonnes/hour milling capacity), Benso Oil Palm Limited (6,316ha, and 27 tonnes/hour milling capacity), and Norwegian Oil Palm Ghana Limited (Norpalm Ghana Ltd) (4,000ha, and 30

tonnes/hour milling capacity). Others are; Juaben Oil Mills, Ayiem Oil Mills, Golden Star, and Volta Red. Ghana Oil Palm Development Company is the largest processor with 100 Metric tonnes per day refinery capacity and a fractionating plant facility. The company employs 250 permanent workers and over 2,000 seasonal workers. There are few industrial processors of palm kernels in Ghana. The West Africa Markets Link (WAML) Industries Limited is among the kernel processors that stand out. The company employs nine permanent staff and 15 casual workers (Ofosu-Budu & Sarpong, 2013). In all, the oil palm industry in Ghana employs over 2 million rural inhabitants (Ministry of Food and Agriculture (MoFA), 2011).

Table 2.16b: Oil palm and products use, 2001 to 2012, Ghana and Nigeria

		Palm kernel Oil				
	Year	**Food (10^3 tonnes)**	**Food per capita (kg)**	**Feed (10^3 tonnes)**	**Seed (10^3 tonnes)**	**Other uses (10^3 tonnes)**
Ghana	2001-2004	9.00	0.40	-	-	8.75
	2005-2008	10.00	0.40	-	-	7.50
	2009-2012	11.75	0.43	-	-	12.00
Nigeria	2001-2004	554.00	3.11	-	-	-
	2005-2008	535.25	2.83	-	-	-
	2009-2012	234.75	2.40	-	-	-

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018. URL:http://www.fao.org/faostat/en/#data/QC

Nigeria's palm oil industry has similar agrosystems as Ghana (e.g. see Izah & Ohimain, 2016, pp.38). As such, small-scale oil palm processors in Nigeria have similar characteristics to that of the Ghanaian processors since their traditional methods of processing are common with traces of improving technology adoption. The small-scale processor accounts for about 80% of the sector's total output in Nigeria (Carrere, 2013). PZ Wilmar Limited is the largest processor. The company has a daily refinery capacity of 1,000 Metric tonnes of CPO. The company currently employs over 300 people in refinery and processing activities alone. Their recent investment in the oil palm sector is expected to create up to 30,000 direct and indirect jobs. Presco plc is a major oil palm estate processor. The company processes 60t fresh fruit bunches per hour and has a palm kernel crushing pant of 100 tonnes per day. The refinery and

fractionation plant has a capacity of 100t per day. Presco employed about 4,027 people (428 permanent staff and 3,599 contract workers) as of April 2016.

Foreign exchange and industrial raw material input have been some of the key motivations for cash crop projects. Net Export volume data on Ghana and Nigeria show that both counties have been on average, net importers of palm oil over the periods (Table 2.17). In the same periods, Ghana and Nigeria have been net exporters of palm kernel cake. Except for the average net export value from the years 2005 to 2008 in Ghana, and 2009 to 2012 in Nigeria, both countries are net exporters of palm kernel oil.

Table 2.17: Net export volumes of oil palm products in Ghana and Nigeria

	Items in tonnes	2005/08	2009/12	2013/16
Ghana	Cake, palm kernel	4968.50	9456.00	7729.00
	Oil, palm	-74755.00	-55383.25	-145820.00
	Oil, palm kernel	-619.25	21991.50	105488.75
Nigeria	Cake, palm kernel	62450.00	66750.00	76800.50
	Oil, palm	-482950.00	-800075.00	-1327700.00
	Oil, palm kernel	175.00	-992.50	2631.75

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018. http://www.fao.org/faostat/en/#data/TP

Cocoa is one of the most important cash crops in Ghana and Nigeria. Although some hybrids thrive in the transition agroecological region, it thrives well in the rainforest regions. In Ghana, production volume and yield have steadily increased, partly thanks to policy interventions in the sector. For instance, the introduction of the mass cocoa spraying exercise to control capsids and black pod disease, the fertilizer subsidy programme and the existence of the Ghana Cocoa Board to manage the production and marketing of cocoa has ensured consistent output performance. The effectiveness of the above intervention and the coverage of the cocoa belt to the total population makes Ghana produce more cocoa than Nigeria per capita (Table 2.18). In Nigeria, production and yield have continuously been declining over the year intervals. Yield growth declined on average by 3 percent between 2009/12 and 2013/16 medium terms. Cocoa was one of the leading export commodities in Nigeria until the discovery and commercial production of crude petroleum. The general neglect of the agriculture sector led to a decline in the impact of cocoa on the economy. Other factors including,

a below-world market price fixed by the Cocoa Marketing Board, resulted in price disincentive and made most farmers abandon their farms (Olaiya, 2016).

Table 2.18: Cocoa cultivation in Ghana and Nigeria 2005-2016

		2005-2008	2009-2012	2013-2016
Ghana	Production (10^3 t)	692.32	730.51	852.91
	Production per capita (kg)	30.96	29.38	31.28
	Yield (10^3 hg/ha)	3.98	4.57	5.13
Nigeria	Production (10^3 t)	413.4	384.18	261.63
	Production per capita (kg)	2.87	3.39	1.47
	Yield (10^3 hg/ha)	3.35	3	2.9

Source: FAO, FAOSTAT Production (crops) (2018). Accessed: 24.01.2018. URL:http://www.fao.org/faostat/en/#data/QC

Available data from FAOSTAT indicate that domestic demand for cocoa comes from its use as food and other use such as liquor, cosmetic products, etc. Cocoa pods and husks usage for farm animal feed is quite common (e.g. see Oddoye et al., 2013). The food demand for cocoa beans and products per capita in Ghana has been higher than in Nigeria (Table 2.19). In Ghana, cocoa consumption per capita increased by about 83 thousand tonnes in the first two medium terms (2005/08 and 2009/12). Perhaps, public promotional activities and urbanisation contributed to the increased consumption. Health education and rebranding St. Valentine's Day as a national chocolate day aimed to boost domestic cocoa product consumption. The non-food demand for cocoa is increasingly high in Ghana than in Nigeria. In Nigeria, where demand for other uses decreased by about 60 per cent between the previous and current medium terms.

Table 2.19: Cocoa and products use, 2001 to 2012, Ghana and Nigeria

	Year	Food (10^3 tonnes)	Food per capita (kg)	Feed (10^3 tonnes)	Seed (10^3 tonnes)	Other uses (10^3 tonnes)
Ghana	**2005-2008**	19.25	0.85	-	-	83.00
	2009-2012	102.00	4.07	-	-	124.00
	2013-2016	37.50	1.36	-	-	112.50
Nigeria	**2005-2008**	13.50	0.09	-	-	171.75
	2009-2012	11.25	0.07	-	-	100.25
	2013-2016	4.00	0.02	-	-	39.50

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018. URL:http://www.fao.org/faostat/en/#data/QC

In Ghana, there are about five important cocoa processing companies. These are the West African Mills Company Limited (WAMCO) (production is at 56,000 tonnes per annum with an installed capacity of 75,000 tonnes), Cargill (annual installed capacity of 65,000 tonnes), Barry Callebaut (annual installed capacity of 60,000 tonnes), Cocoa Processing Company (annual installed capacity of 30,000 tonnes), and Afro Tropic Cocoa Pressing (annual installed capacity of 15,000 tonnes). In Nigeria, the prominent cocoa processing companies are Cadbury Nigeria Plc (about 781 employees in Nigeria), FTN Cocoa Processors Plc (annual installed capacity of 60,000 metric tonnes with 109 employees as of 2014), and Cocoa Products (Ile-Oluji) Limited (annual installed capacity of 30,000 Metric tonnes per annum).

Ghana and Nigeria are net exporters of cocoa beans and products (Table 2.20). As expected, Ghana has a much more trade surplus in cocoa and cocoa products than Nigeria since Ghana is a major producer of cocoa.

Table 2.20: Net export volumes of cocoa products, Ghana and Nigeria

	Items in tonnes	2005/08	2009/12	2013/16
Ghana	Cocoa, beans	526367.25	490117.75	603323.50
	Cocoa, butter	14385.75	22489.75	28410.50
	Cocoa, paste	19654.50	1504.50	67013.00
	Cocoa, powder & cake	14953.50	5256.50	37056.75
Nigeria	Cocoa, beans	214837.00	222624.50	200092.00
	Cocoa, butter	9799.50	11679.25	16296.83
	Cocoa, paste	950.75	724.25	1205.00
	Cocoa, powder & cake	5161.00	9078.25	11031.25

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018. http://www.fao.org/faostat/en/#data/TP

2.2.3 **Livestock**

Livestock production constitutes an avenue for either primary or secondary income for households. In rural households, it is a form of investment and insurance. In Africa, livestock population density factors in the availability of free grazing land, human population, and culture. As such, Nigeria possesses higher livestock heads than Ghana in all the livestock (cattle, sheep, goats, pigs, and chicken) considered in this sub-section (Table 2.21). Moreover, Nigeria currently accounts for about 39.6 percent of all livestock produced in West Africa –one of the leading producers in the region (Food and Agriculture Organization (FAO), 2018). Livestock heads in both countries have generally increased in the last three medium terms except for chicken in Nigeria. Chicken production decreased by about 18 percent between 2009/12 and 2013/16 after an initial increase of 5 percent

Table 2.21: Livestock head in Ghana and Nigeria, 2006-2016

Country	Livestock	2005-2008	2009-2012	2013-2016
Ghana	Cattle(10^6)	1.37	1.48	1.68
Nigeria		16.08	17.82	19.97
Ghana	Sheep(10^6)	3.37	3.83	4.38
Nigeria		32.7	36.98	41.33
Ghana	Goats(10^6)	4.13	5.01	6.12
Nigeria		51.86	61.98	72.27
Ghana	Pigs(10^6)	0.44	0.56	0.70
Nigeria		6.52	6.87	7.16
Ghana	Chickens(10^6)	34.82	50.38	68.86
Nigeria		162.42	170.9	140.84

Source: FAO, FAOSTAT Production (crops) (2018). Accessed: 24.01.2018. URL:http://www.fao.org/faostat/en/#data/QC

Apart from food, textile, and organic manure use of livestock, other by-products such as fat from livestock are important elements for biomass energy production. The main food product from livestock in both countries is meat. Consumption per capita of beef and veal generally declined in Ghana after an initial peak of 1.32 kg in the 2005-2008 average (Table 2.22). In Ghana, projections into the next medium term also predict a decline in beef and veal consumption per capita. In Nigeria, beef and veal consumption per capita declined by about 31 percent after an initial peak of 1.45kg per capita in the 2005/08 average year. Consumption on average increased from 2013 to 2016 (about 1.65 kg/capita). In the next medium-term (2017/20), however, consumption per capita is projected to reduce by about 2 percent.

Sheep meat consumption per capita in Ghana generally increased over the years. Sheep consumed per capita growth will be about 5 percent in the next medium-term (2017-2020). In Nigeria, sheep meat consumption per capita generally declined over the year averages. Sheep meat consumption per capita growth will decrease by about 1 percent. Likewise, for sheep meat, consumption of pig meat per capita in Ghana generally increased, while in Nigeria, it is a decrease. In Ghana, the growth in consumption of pig meat will be about 4 percent, whiles in Nigeria, the growth rate will be about 6 percent.

Table 2.22: Livestock consumption per capita in Ghana and Nigeria (kg/per capita/year)

Country	Products	2005-2008	2009-2012	2013-2016	2017-2020*
Ghana	Beef and veal	1.32	0.92	0.85	0.82
Nigeria		1.45	1.26	1.65	1.62
Ghana	Sheep meat	1.21	1.53	1.52	1.59
Nigeria		2.48	1.99	2.36	2.32
Ghana	Pig meat	0.70	0.76	0.82	0.85
Nigeria		1.11	1.15	1.12	1.05
Ghana	Poultry meat	4.33	5.82	6.43	6.35
Nigeria		1.46	1.13	0.90	0.91

**projected average*

Source: OECD, OECD data (Meat Consumption) (2018). Accessed: 12.02.2018. URL:https://data.oecd.org/agroutput/meat-consumption.htm

Of the entire meat product under discussion, poultry meat is the only meat product where Ghana surpasses Nigeria in consumption per capita. While poultry consumption per capita in Ghana generally showed an increasing trend, there has been a general declining trend of poultry meat consumption per capita in Nigeria throughout the three medium terms. However, as poultry consumption per capita in Ghana will decrease by about 1 percent, Nigeria is expected to increase by 2 percent in the subsequent medium-term (2017/20).

International trade data on meat from livestock indicates that Ghana and Nigeria are net importers (Table 2.23). This observation implies that both countries fall short in supplying their domestic market. In general, Ghana imports more livestock meat than Nigeria. Chicken meat drives the key import demand of livestock meat in both countries. Ghana imports far greater volumes of chicken meat than Nigeria.

Table 2.23: Net export volumes of livestock meat, in Ghana and Nigeria

	Items in tonnes	2005/08	2009/12	2013/16
Ghana	Meat, cattle	-1030.25	-690.25	-1751.58
	Meat, cattle, boneless (beef & veal)	-6597.00	-4146.25	-2307.67
	Meat, chicken	-62089.75	-124353.75	-126950.50
	Meat, goat	-0.50	-3.25	-5.33
	Meat, pig	-874.50	-625.25	-2112.17
	Meat, sheep	-5572.00	-5786.25	-4443.50
Nigeria	Meat, cattle	-43.00	-97.00	-63.75
	Meat, cattle, boneless (beef & veal)	-130.75	-157.00	-219.00
	Meat, chicken	-939.00	-19770.00	-317.00
	Meat, goat			-1.50
	Meat, pig	-94.25	-132.25	-71.25
	Meat, sheep	-25.00	-28.25	-38.50

Source: FAO, FAOSTAT Food Balance Sheet (2018). Accessed: 08.02.2018. http://www.fao.org/faostat/en/#data/TP

Livestock processing in Ghana and Nigeria is mostly rudimentary and done at the household level for consumption or sale to a small group of customers. Small-scale processors dominate the livestock sector. However, there are relatively large-scale processors doted in urban centres. Darko Farms and Asamoah & Yamoah Farms are the large-scale chicken processors in Ghana. They have a combined processing capacity of 15,000 birds per day. Others are Jonny's Food and Meat Complex, Santinos, and Jfamco. Their processing activities include cutting and packaging fresh local poultry, beef, pork, and sausages (Ministry of Food and Agriculture (MoFA), 2016). In Nigeria, the leading meat processors are, Zartech (processed chicken and beef), Choice Farms (processed chicken), Meat World Foods Ltd (meat and fish products), Best Foods Global Nigeria Limited (livestock and seafood processing), and a host of others.

To summarise section 2.2, we find that the land area of Nigeria produces higher volumes of crops and livestock understudied than Ghana, except for cocoa. This could

be attributed to land and population size of Nigeria. However, in most cases, Ghana has a superior yield for most of the produced crops. A greater volume of cassava is demanded as food per capita in Ghana than in Nigeria with an increasing trend. In Nigeria, the demand for maize is mainly for food, although there is significant feed use whiles in Ghana, the use of maize for livestock feed outweighs food consumption. The non-food use of cocoa and oil palm is prominent among the two countries throughout the three medium terms. Except for cocoa beans and products, palm kernel cake and oil, and dried cassava and cassava flour, Ghana and Nigeria are generally net importers of crops and livestock. Cassava and maize, being a common staple food for both countries, are expected to be intensified in the future due to increasing consumption per capita and its use as livestock feed. Poultry and small ruminant (sheep, pig and goat) rearing also hold for the future due to increasing consumption per capita. Cocoa will continue to play a major role in the export market. The several formal agro-processing firms with varying production capacities identified in both countries provided an adequate number of both permanent and casual employment through their processing facilities.

Developments in Ghana and Nigeria have an implied expectation of the role of the agricultural sector. In theory, the agriculture sector's contribution to the economy declines as the economy develops (eg. see Lewis, 1954). The observation so far has consequences on the agricultural sector's contribution to the gross domestic product (GDP) and employment as illustrated in the next section.

2.3 The agriculture factor in national income and employment

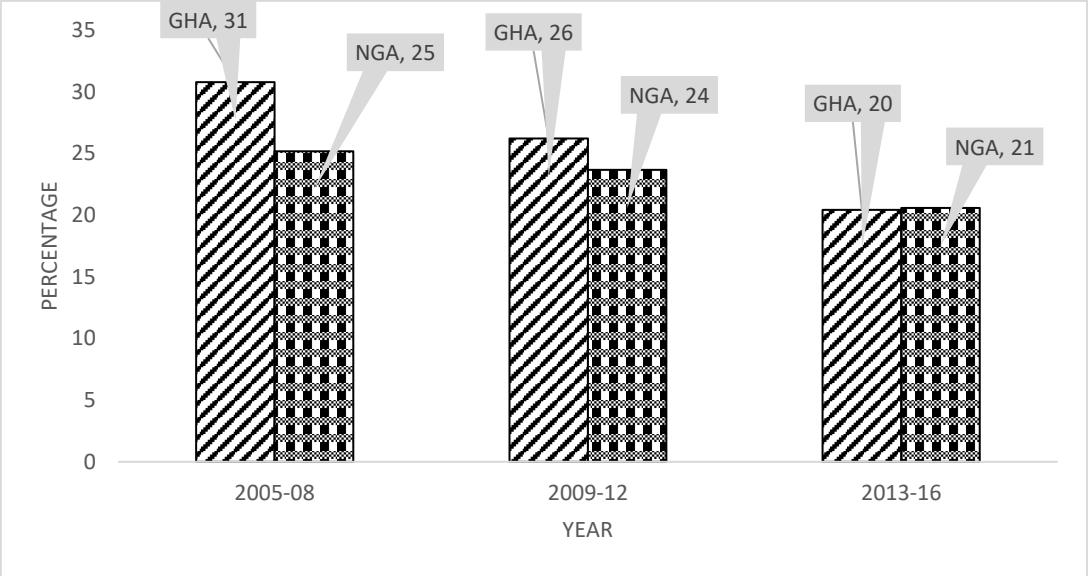
The agricultural sector is one of the three main sectors of the economy. The sector’s importance to the development process in Ghana (GHA) and Nigeria (NGA) is in its employment and national income contributions.

2.3.1 National income

The contribution of crop production, livestock keeping, forest-related activities and aquaculture to gross domestic product (GDP) defines the relative size of the agricultural sector within the national economy (United Nations, 2008). In the course of economic development, the share of the agriculture sector in national income has been declining over the recent decades in both countries (Figure 2.1). In Ghana, the contribution decreased from about 31 percent to about 20 percent between 2005/08

and 2013/16 in the three medium terms. Nigeria's experienced quite a smooth reduction from about 25 percent to 21 percent in the respective periods.

Figure 2.1: Agriculture's percentage share in value-added in Ghana and Nigeria (percent of GDP)



Source: (World Bank, 2018), ULR: https://databank.worldbank.org/source/world-development-indicators, Accessed 20.02.2018

Detailing the components of the agricultural sector, the crop subsector contributed not less than 70 percent of agriculture's value-added in Ghana over the three medium terms (Table 2.24). Alone as a cash crop, cocoa showed its significance by a contribution of not less than an average of 10 percent of value-added over the period in Ghana. The third most important contributor to agricultural value-added after forestry is livestock production which averages around 8 percent throughout the medium term. The forestry and logging sector contributed an average of not less than 10 percent through the three medium terms. The forestry value addition has been declining consistently over the three medium terms. Increased urbanisation and farmland expansion are one could be attributed to this. In the case of Nigeria, the crop subsector contributed over 80 percent of agricultural value-added. Livestock, the second-highest contributor to agricultural value-added, contributed an average of not less than 7 percent. Forestry contributed less value-addition over the decade (less than 2 percent).

Table 2.24: Composition of agricultural value-added, 2006-2016 (percent of total agricultural GDP)

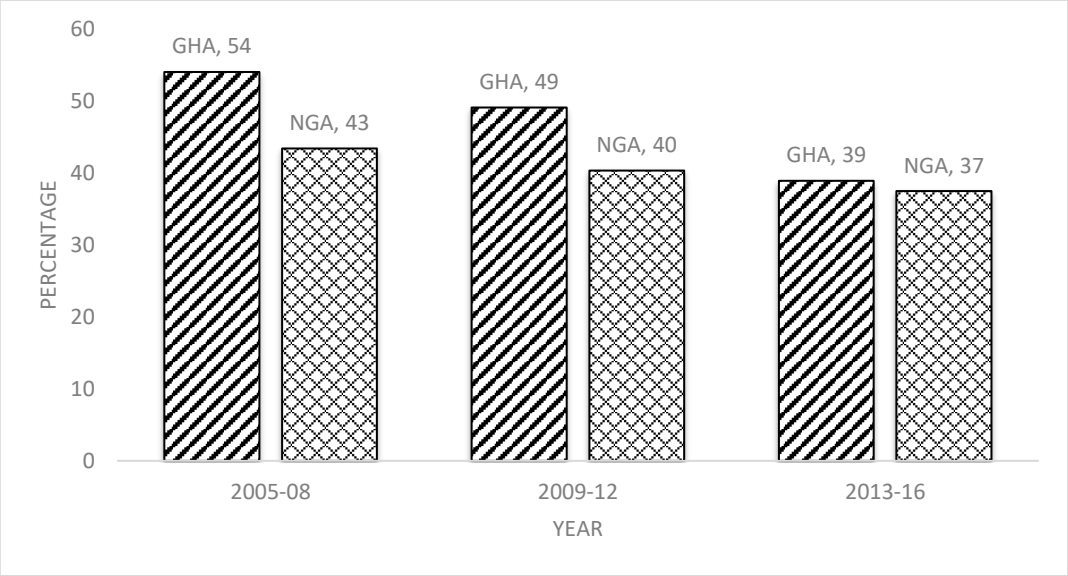
		2005-2008	2009-2012	2013-2016
Ghana	Crops	70.20	73.69	74.35
	o.w. Cocoa	13.66	14.09	12.66
	Livestock	8.34	8.39	8.90
	Forestry and Logging	13.43	10.85	10.19
	Fishing	8.05	7.08	6.57
Nigeria	Crop	89.62	89.69	89.67
	Livestock	7.41	7.30	7.11
	Forestry and Logging	1.05	1.04	1.05
	Fishing	1.91	1.97	2.19

Source: Ghana Statistical Service, 2018 and Central Bank of Nigeria, 2018. Accessed: 13.02.2018 ULR:http://www.statsghana.gov.gh/gdp_bulletin.html and http://statistics.cbn.gov.ng/cbn-onlinestats/DataBrowser.aspx

2.3.2 **Employment**

Agricultural employment over the past three medium terms decreased (Figure 2.2). In Ghana, the sector's employment on average decreased by more than 10 percent while in Nigeria, the decrease has not been drastic. Small-scale producers are more likely to give up farming to other sectors which compete for their resources (land and labour). Large-scale producers replacing small-scale farmers is implied in economic development theory (e.g see Lewis, 1954). Perhaps, Ghana has a larger pool of small-scale farmers explaining the greater rate of decline.

Figure 2.2: Employment in agriculture in Ghana and Nigeria (percent of total)



Source: (World Bank, 2018), ULR: https://databank.worldbank.org/source/world-development-indicators, Accessed 20.02.2018

Agricultural employment data are usually not comprehensive but rather in the form of estimations and projections from commissioned studies (e.g. see Nnadozie et al., 2015). The Ghana Living Standard Survey (GLSS) and the general household survey (GHS) data of Nigeria are databases in which agricultural employment information is available (Table 2.25). The table re-confirms that agriculture is majorly a rural-based economic activity. The sector provides not less than 70 and 60 percent of employment in Ghana and Nigeria.

Because of the already mentioned challenge in getting the exact number of people employed, we assumed the agriculture sector to be predominantly rural-based (supported by Table 2.25). We use the product of the total number of households engaged in a specific agricultural sub-sector and the average rural household size to estimate the potential number of labour employed in production activities of the understudied commodities.

The survey weights are used in the estimation of potential employment in the agricultural sector. The survey weights make estimates more representative of the population and reduce bias arising from non-response or sampling design (Johnson, 2008). Since the survey is deemed to be nationally representative, and with the weights, comparison of survey outputs for differences is possible.

Table 2.25: Share of employment 15 years and older by major sectors (percent of total)

	Economic sectors	Ghana		Nigeria	
		GLSS5	GLSS6	GHS2	GHS3
Urban	Agriculture	17.30	18.5	12.6	11.30
	Industry	18.60	21.7	15.3	15.60
	Services	64.10	59.8	72.1	73.10
	Total	**100**	**100**	**100**	**100**
Rural	Agriculture	72.2	76.6	61	60.50
	Industry	9.6	9.1	10.1	10.10
	Services	18.2	14.3	28.9	29.40
	Total	**100**	**100**	**100**	**100**

Source: Authors' estimation using GLSS 5(2005/06) and 6(2012/13) (Ghana Statistical Service (GSS), 2014, 2018) and GHS2(2012/13) and 3(2015/2016) (National Bureau of Statistics (NBS), 2014, 2017).

The estimation of the employment potential is done by considering survey weights. The survey weights make estimate more representative of the population and reduces bias due to nonresponse or sampling design (Johnson, 2008). To account for sampling weights, clusters and stratification of the survey, the STATA survey "svy" command is used to ensure the right outputs of point estimates (StataCorp., 2021).

Table 2.26 indicates that cassava and maize production generates the most number employment among the food crops understudy. In Ghana, maize production employed no less than 17 thousand individuals in the 2012/13 production season. In the same production season, no less than 13 thousand labour were in cassava production. There has been an increase of about eight thousand and four thousand maize and cassava producer workers from the previous survey season (2005/06).

Table 2.26: Potential employment from the cultivation of selected agricultural commodities

		GLSS5(2005/06)		GLSS6 (2012/13)	
	Ghana	**Total Households Number**	**Potential Number employed**	**Total Households Number**	**Potential Number employed**
Food crops	Cassava	4,168	9,896	5,552	13,539
	Sorghum	1,009	2,396	1,131	2,758
	Maize	4,142	9,834	7,158	17,455
Cash crops	Oil palm	1,089	2,586	863	2,104
	Cocoa	1,589	3,773	3,010	7,340
	Sugarcane	56	133	38	93
Livestock	Cattle incl.calves	494	1,173	1,168	2,848
	Sheep	1,191	2,828	2,337	5,699
	Goats	1,983	4,708	3,986	9,720
	Pigs	408	969	986	2,404
	Chicken	2,970	7,052	6,085	14,838
	Nigeria	**GHS2(2012/13)**		**GHS3(2015/16)**	
Food crops	Cassava		21,696		19,107
	Sorghum		21,003		18,196
	Maize		22,146		21,545
Cash crops	Oil palm		2,729		1,864
	Cocoa		3,352		2,792
	Sugarcane		78		100
Livestock	Cattle incl.calves	3081	21,128	3012	21,779
	Sheep	684	4,690	673	4,866
	Goats	1360	9,326	1378	9,964
	Pigs	65	446	74	535
	Chicken	3081	21,128	3012	21,779

** blank cells/spaces: household size was not used in estimation as respondents were explicitly asked in the questionnaire for number employed in production. Note: average rural household number of dependants for GLSS5=2.37; GLSS6=2.44; GHS2=6.86; and GHS3=7.23*

Source: Authors' estimation using GLSS5 and 6 (GSS, 2007, 2014) and GHS2 and 3 (National Bureau of Statistics (NBS), 2014, 2017).

For cash crops in Ghana, cocoa and oil palm production provided over seven thousand and two thousand employees in the 2012/13 production season. Labour employed in cocoa bean production increased by more than three thousand individuals. Over 14 thousand and nine thousand labour forces were into chicken and goat production in the livestock sub-sector. From the previous survey season (2005/06), this represents an increase of more than seven thousand and five thousand individuals associated with its rearing.

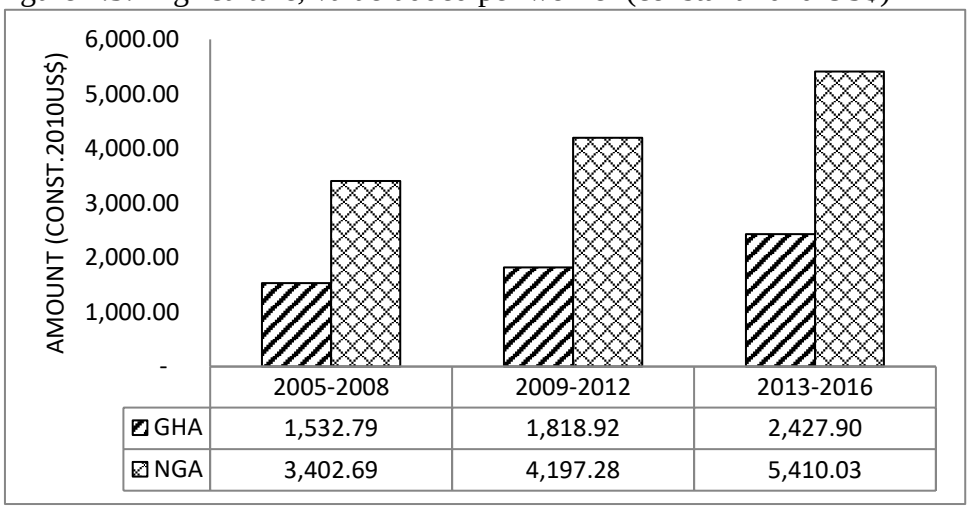
In Nigeria, over 21 thousand and 19 thousand labour force were in maize and cassava production for the 2015/16 production season. The size of the labour force in maize and cassava production declined by about 596 and 2,589 from the previous survey (2012/13). Over two thousand and one thousand labour force were in cocoa and oil palm production in the 2015/16 production season. The labour force size in cocoa and oil palm production increased by about 560 and 865 individuals from the previous survey (2012/13). For livestock, the current survey results indicate that over 21 thousand people were associated with cattle and chicken production. There is an increase of 651 in the number of individuals employed from the previous survey.

2.3.3 **Factor contributions to agriculture performance**

Trends in agricultural value-added per unit factor used in agriculture production indicate productivity gain or otherwise in the economy. It also provides general information about the efficiency and quality of the given factor input. In Ghana and Nigeria, there is a general increasing trend in labour productivity over the periods (Figure 2.3).

In the successive medium-term averages, Nigeria has a higher agriculture value added per worker than Ghana. The value addition of agriculture averaged about 103 billion in Nigeria between 2013 and 2016, whiles Ghana recorded 10 billion (about ten times less) (World Bank, 2018) -explaining the relatively high variation observed in Figure 2.3. The relatively high agricultural value addition per worker in Nigeria stem from several sectors including the high volume of commercial production.

Figure 2.3: Agriculture, value-added per worker (constant 2010 US$)



	2005-2008	2009-2012	2013-2016
GHA	1,532.79	1,818.92	2,427.90
NGA	3,402.69	4,197.28	5,410.03

Source: (World Bank, 2018), ULR: https://datacatalog.worldbank.org/public-licenses#cc-by, Accessed 20.02.2018

In summary, this section finds that agriculture's value addition and employment successively declined in both countries. A subsector analysis of the agricultural sector revealed that the crop subsector contributes most of agriculture's value addition to the GDP. Further, on the specific commodities, cassava and maize (as in food crops), cocoa and oil palm (as in cash crops) had the greater potential for job creation in both countries. For livestock, poultry (chicken) and goats in Ghana and poultry and cattle in Nigeria have the potential to employ most labour force. In both countries, there has been increasing agricultural labour productivity growth for three consecutive medium terms.

2.4 **Conclusion**

This chapter provided a situational analysis of the agriculture sector to the economy of Ghana and Nigeria. The FAOSTAT, WDI and national statistics data sources -the GLSS and GHS, were used for analysis. Medium-term year intervals for the production, yield, demand and international trade for selected agricultural commodities were investigated and discussed. In addition, the section touched on income, employment contribution and trends in labour productivity of the agriculture sector to the economies. Specific biomass sub-sectors considered in this chapter were:

food crops (cassava, sorghum, and maize), cash crops (oil palm, and cocoa), livestock (cattle, sheep, goats, pigs, and chicken) and fuel (charcoal, and firewood).

Both countries exhibited variations in production, yield and consumption of the food crops, cash crops, and livestock considered in this study. There is a chance for knowledge sharing of good agricultural practices to ensure productive growth of the agriculture sector in the sub-region.

Despite the increments in agricultural value-added per worker, the countries experienced rising import dependence on staple food and livestock products considered in this chapter. This dependence means that the sector does not produce an exportable surplus even though there is labour productivity in the agriculture sector.

The agricultural sector will continue to contribute meaningfully to employment and national income at a decreasing rate in the sub-region. The Lewis two-sector model proposed this declining trend in the agriculture sector. Other sectors will have to cater for the decline of the agriculture sector in the development process. The conventional theory predicts a manufacturing sub-sector of the industrial sector to be the most productive sub-sector to attract the most migrating labour from the agriculture sector. The next chapter presents a study of the interaction of other sectors with the agriculture sector.

2.5 References

Adeyemo, T. A., Amaza, P., Okoruwi, V., & Abass, A. (2016, September). The food security effect of a biomass value web concept among smallholder cassava households in Edo State Nigeria. *2016 Fifth International Conference, September 23-26, 2016, Addis Ababa, Ethiopia*. https://doi.org/10.22004/ag.econ.249319

Ajakaiye, A. (2017, August 28). Northern Nigeria Flour Mills invests N2bn in new sorghum plant in Kano. *Businessday NG*. https://businessday.ng/business-economy/article/northern-nigeria-flour-mills-invests-n2bn-new-sorghum-plant-kano/

Angelucci, F. (2013). *Analysis of incentives and disincentives for sorghum in Ghana* (pp. 1–30) [Technical notes series, MAFAP]. Food and Agriculture Organization of the United Nations.

Ben-Iwo, J., Manovic, V., & Longhurst, P. (2016). Biomass resources and biofuels potential for the production of transportation fuels in Nigeria. *Renewable and Sustainable Energy Reviews*, *63*, 172–192. https://doi.org/10.1016/j.rser.2016.05.050

Carrere, R. (2013). *Oil palm in Africa: Past, present and future scenarios* (15; WRM Series on Tree Plantatons, p. 79). World Rainforest Movement (WRM). https://wrm.org.uy/wp-content/uploads/2014/08/Oil_Palm_in_Africa_2013.pdf

Chauvin, N. D., Mulangu, F., & Porto, G. (2012). Food Production and Consumption Trends in Sub-Saharan Africa: Prospects for the Transformation of the Agricultural Sector. In *UNDP Africa Policy Notes* (2012–011; UNDP Africa Policy Notes, pp. 1–74). United Nations Development Programme, Regional Bureau for Africa. https://ideas.repec.org/p/rac/wpaper/2012-011.html

Cravotta, C. (1997). Use of Stable Isotopes of Carbon, Nitrogen, and Sulfur to Identify Sources of Nitrogen in Surface Waters in the Lower Susquehanna River Basin, Pennsylvania. In *US Geological Survey Water Supply Paper* (Vol. 2497).

Daum, T., & Birner, R. (2020). Agricultural mechanization in Africa: Myths, realities and an emerging research agenda. *Global Food Security*, *26*, 100393. https://doi.org/10.1016/j.gfs.2020.100393

Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Seyboth, K., Matschoss, P., Kadner, S., Zwickel, T., Eickemeier, P., Hansen, G., Schloemer, S., & von Stechow, C. (2012). *Renewable energy sources and climate change mitigation: Special report of the Intergovernmental Panel on Climate Change* (p. 1075 pp). Intergovernmental Panel on Climate Change. http://choicereviews.org/review/10.5860/CHOICE.49-6309

Elbehri, A., Segerstedt, A., & Liu, P. (2013). *Biofuels and the sustainability challenge: A global assessment of sustainability issues, trends and policies for biofuels and related feedstocks*. Trade and Markets Division, Food and Agriculture Organization of the United Nations.

Engel, E., Rettberg, S., Rauch, T., Neubert, S., Minah, M., & Berg, C. (2017). *Towards Inclusive and Sustainable Rural Transformation in Sub-Saharan Africa* (SLE Discussion Paper 07/2017; p. 109). Humboldt-Universität zu Berlin, Centre for Rural Development (SLE). https://www.sle-berlin.de/files/sle/publikationen/Final%20Report_Towards%20Inclusive%20and%20Sustainable%20Rural%20Transformation%20in%20Sub-Saharan%20Africa.pdf

FMARD. (2016). *The Agriculture Promotion Policy (2016-2020)* (pp. 1–50). Federal Ministry of Agriculture and Rural Development (FMARD). https://fscluster.org/sites/default/files/documents/2016-nigeria-agric-sector-policy-roadmap_june-15-2016_final1.pdf

Food and Agriculture Organization (FAO). (2018). *FAOSTAT*. Food and Agricultural Organisation of the United Nations. http://www.fao.org/faostat/en/#data/QC

Food and Agriculture Organization(FAO). (2018). *Food outlook: Biannual report on global food markets -November 2018.* (p. 104). Food and Agriculture Organization of the United Nations & Trade and Markets Division, 2018. http://www.fao.org/3/ca2320en/CA2320EN.pdf

Ghana Statistical Service (GSS). (2014). *Ghana—Ghana Living Standards Survey 6 (With a Labour Force Module) 2012-2013, Round Six—Overview*. https://www2.statsghana.gov.gh/nada/index.php/catalog/72/study-description

Ghana Statistical Service (GSS). (2018). *Ghana—Ghana Living Standard Survey (GLSS 7) 2017*. https://www2.statsghana.gov.gh/nada/index.php/catalog/97

Gourichon, H. (2013). *Analysis of incentives and disincentives for sorghum in Nigeria* (p. 35) [Technical notes series, MAFAP]. Food and Agriculture Organization of the United Nations.

Hall, D. O., & House, J. I. (1994). Trees and biomass energy: Carbon storage and/or fossil fuel substitution? *Biomass and Bioenergy*, *6*(1), 11–30. https://doi.org/10.1016/0961-9534(94)90081-7

Izah, S. C., & Ohimain, E. I. (2016). The opportunities and weakness of Nigerian oil palm industry. *Biotechnological Research Journal*, *2*(1), 33–43.

Jingura, R. M., & Matengaifa, R. (2009). Optimization of biogas production by anaerobic digestion for sustainable energy development in Zimbabwe. *Renewable and Sustainable Energy Reviews*, *13*(5), 1116–1120.

Johnson, D. R. (2008). *Using Weights in the Analysis of Survey Data*.

Kleih, U., Phillips, D., & Wordey, M. T. (2013). *Cassava Market and Value Chain Analysis Ghana Case Study* (Technical Report CAVA.2013:19; p. 66). Natural Resources Institute, University of Greenwich, UK and Food Research Institute, Accra, Ghana. https://cava.nri.org/images/documents/publications/GhanaCassavaMarketStudy-FinalFebruary2013_anonymised-version.pdf

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *The Manchester School of Economics*, *22*(2), 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

Ministry of Food and Agriculture (MoFA). (2011). *MASTERPLAN STUDY ON THE OIL PALM INDUSTRY IN GHANA* (pp. 1–134) [FINAL REPORT]. Ministry of Food and Agriculture (MOFA). https://mofa.gov.gh/site/publications/research-reports/96-masterplan-study-on-the-oil-palm-industry-in-ghana

Ministry of Food and Agriculture (MoFA). (2015). *Medium Term Agricultural Sector Investment Plan (METASIP) II, 2014 – 2017*. MOFA. http://mofa.gov.gh/site/wp-content/uploads/2016/10/METASIP-II.pdf

Ministry of Food and Agriculture (MoFA). (2016). *Ghana Livestock Development Policy and Strategy*. MOFA. http://mofa.gov.gh/site/

Mittal, A. (2009). *The 2008 Food Price Crisis: Rethinking Food Security Policies* (G-24 Discussion Paper Series 56). UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT. https://unctad.org/system/files/official-document/gdsmdpg2420093_en.pdf

Mohammed, Y. S., Mokhtar, A. S., Bashir, N., & Saidur, R. (2013). An overview of agricultural biomass for decentralized rural energy in Ghana. *Renewable and Sustainable Energy Reviews*, *20*, 15–25. https://doi.org/10.1016/j.rser.2012.11.047

National Bureau of Statistics (NBS). (2014). *Nigeria—General Household Survey, Panel 2012-2013, Wave 2*. https://microdata.worldbank.org/index.php/catalog/1952

National Bureau of Statistics (NBS). (2017). *Nigeria—General Household Survey, Panel 2015-2016, Wave 3*. https://microdata.worldbank.org/index.php/catalog/2734

Naziri, D., Sergeant, A., Graffham, A., Sanni, L., Abayomi, L., & Siwoku, B. (2013). *Market opportunities for cassava in Nigeria* (p. 48) [Technical Report]. Natural Resource Institute (NRI), University of Greenwich.

Nnadozie, A. K. O., Ume, S. I., Isiocha, S., & Njoku, I. A. (2015). Nigerian Cassava Potentials in National Economic Development. *Science Journal of Business and Management*, *3*(5), Article 5. https://doi.org/10.11648/j.sjbm.s.2015030501.20

Nweke, F. (2004). New challenges in the cassava transformation in Nigeria and Ghana: In *EPTD discussion papers* (118; EPTD Discussion Papers, p. 118). International Food Policy Research Institute (IFPRI). https://ideas.repec.org/p/fpr/eptddp/118.html

Oddoye, E. O. K., Agyente-Badu, C. K., & Gyedu-Akoto, E. (2013). Cocoa and Its By-Products: Identification and Utilization. In R. R. Watson, V. R. Preedy, &

S. Zibadi (Eds.), *Chocolate in Health and Nutrition* (pp. 23–37). Humana Press. https://doi.org/10.1007/978-1-61779-803-0_3

OECD & FAO. (2016). *OECD-FAO Agricultural Outlook 2016-2025*. OECD. https://doi.org/10.1787/agr_outlook-2016-en

Ofosu-Budu, K., & Sarpong, D. B. (2013). Oil palm industry growth in Africa: A value chain and smallholders' study for Ghana. In A. Elbehri (Ed.), *Rebuilding West Africa's Food Potential* (pp. 349–389). FAO/IFAD.

Olaiya, T. A. (2016). Examining the Political-economy of Cocoa Exports in Nigeria. *The International Journal of Applied Economics and Finance*, *10*(1–3), 1–13. https://doi.org/10.3923/ijaef.2016.1.13

Openshaw, K. (2010). Biomass energy: Employment generation and its contribution to poverty alleviation. *Biomass and Bioenergy*, *34*(3), 365–378. https://doi.org/10.1016/j.biombioe.2009.11.008

Opoku, J., & Asante, F. A. (2018). *Palm oil production in Ghana, Final Report on the status of the oil palm industry in Ghana* [Final Technical Report]. German Technical Co-operation (GTZ).

Poku, K. (2002). *Small-scale palm oil processing in Africa*. Food and Agriculture Organization of the United Nations.

Popp, J., Lakner, Z., Harangi-Rákos, M., & Fári, M. (2014). The effect of bioenergy expansion: Food, energy, and environment. *Renewable and Sustainable Energy Reviews*, *32*, 559–578. https://doi.org/10.1016/j.rser.2014.01.056

Rao, P. G. (2006). *Rural Development Sustainable Livelihood and Security*. Authors press.

StataCorp. (2021). *STATA Manual*. StataCorp LLC. https://www.stata.com/manuals/svysvy.pdf

The International Food Policy Research Institute (IFPRI). (2017). *2017 Global Food Policy Report* (9780896292529; pp. 1–119). International Food Policy Research Institute. https://doi.org.10.2499/9780896292529

United Nations (Ed.). (2008). *International Standard industrial classification of all economic activities (ISIC)* (Rev. 4). United Nations. https://www.bundesbank.de/resource/blob/612626/067f5294c6df434ea4528bdb62551f9b/mL/isic-rev-4-data.pdf

World Bank. (2018). *World Development Indicators | DataBank*. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators

World Bank. (2020, June 20). *World Development Indicators | DataBank*. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators

Yeboah, F. K., & Jayne, T. S. (2015). *Employment Trends in Sub-Saharan Africa: The Evolving Role of Agriculture* [International Development Working Paper]. Michigan State University.

Chapter 3
Comparative analysis of the structural transformation process in sub-Saharan Africa (SSA) and South-East Asia (SEA)

Abstract.

This section examines the differences and similarities to the structural change process in the economic structure of sub-Saharan Africa (SSA) and South-East Asia (SEA). We used time-series data from the World Development Indicators to understudy the economies of Ghana, Nigeria, Vietnam, and Thailand. The analysis finds that the countries perform quite differently in their economic trajectory. The SEA countries were more labour productive in the agriculture sector than SSA countries. Structural change in SSA did not entirely exhibit the pattern of the Asian industrialisers. Although historically having low productivity in developing economies, the services sector has a significant role in the structural transformation process of African economies.

Keywords: Structural transformation, economic growth, GDP, employment

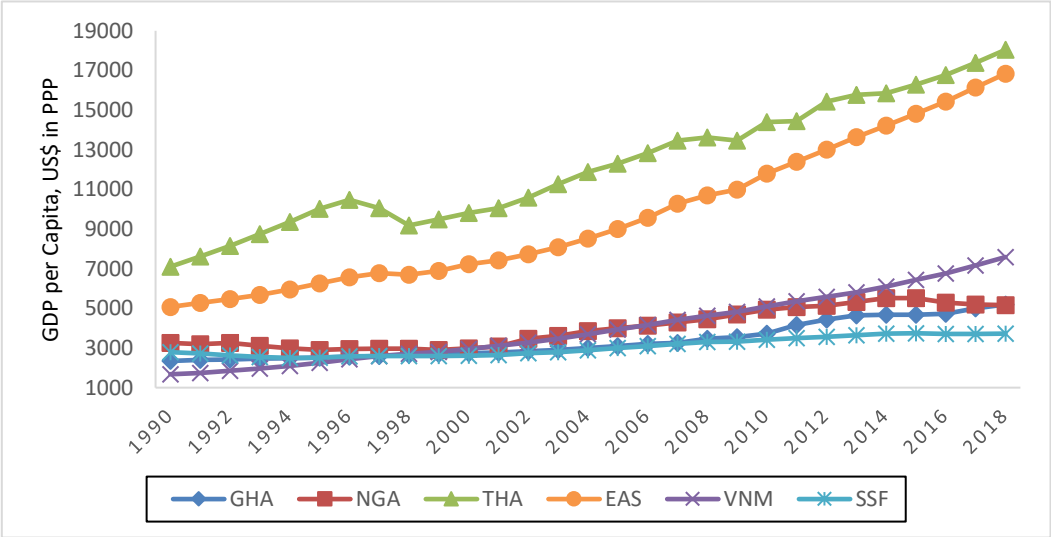
3.1 Introduction

Economic growth and development lead to poverty alleviation and living standard improvement in most economies: “Nothing has worked better than economic growth in enabling societies to improve the life chances of their members, including those at the very bottom” (Rodrik, 2007, 2018, pp.2).Sustained growth and development trigger cycles of investment which create employment opportunities for the poor to

break out of the poverty trap. In effect, growth becomes beneficial if the proceeds translate into public goods for the lower-income strata of society.

The Sub-Saharan African (SSA) region recorded a gradual increase in the gross domestic product (GDP) per capita in purchasing power parity (PPP) of about US$ 2,783 in 1990 to about US$ 3,720 in 2018 (an average annual growth rate of 1.04 percent) (Figure 3.1). Ghana and Nigeria's per-capita incomes grew at an average rate of about 2.88 and 1.65 percent per annum, respectively. Growth data since the middle of 1971s indicate that SSA and SEA started from a similar economic situation. In the years after, the economic performance of SEA has increased exponentially with an ever-widening gap between the economies of SSA. Within the SEA region, Vietnam's annual growth rate of 5.55 has been one of the highest. Thailand in the SEA region had lower GDP per capita in the early 1990s than Ghana and Nigeria. However, Vietnam's annual growth rate of 3.39 percent from 1990 to 2018 is superior to both countries.

Figure 3.1: Trends in GDP per capita, PPP (constant 2011 international $) of SSA and SEA countries



Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

After World War II, few developing nations attained the convergence of structural characteristics of the advanced nations. They experienced higher economic growth enhanced by the manufacturing sector. Of the 13 countries listed to have had high sustained growth rates since 1950 for 25 years or more, North and South-East Asia accounts for all but five of these countries (Sumner, 2018). The countries in these

regions have all transitioned from being poor, and agrarian to middle-income countries with developed industrial and manufacturing bases. Countries like Thailand experienced a long period of no growth per capita from 1900-1950 but it is currently one of the best economies in the region. Though Africa's recent economic performance has vastly improved, the region is largely "bypassing industrialization as a major driver of growth and jobs" (World Bank, 2014). We examine how structures in the economies of the countries in the SSA and SEA region have recently been changing; the divergences and similarities of sector-driven changes are the focus of this study. This is to bring an understanding of the economic growth in the two regions by comparing Ghana, Nigeria, Vietnam, and Thailand as examples. Using the classical perspective of structural change (Lewis, 1954) these economies are examined by looking at sectoral productivity, shares in GDP and employment, and the employment-value addition difference.

A two-sector analysis by Lewis (1954), Harris and Todaro (1970), and others provide an analytical framework on how economies transform from agrarian to industrial. Focusing on employment, Lewis (1954) proposed a conceptual model for these inter-sectoral change processes that are still useful in understanding economic growth. He claims that – as a consequence of increasing labour productivity from farming innovations – the traditional agricultural sector starts supplying an increasing stock of underemployed "surplus" labour. A wage differential between the farm sector and manufacturing emerges and is sufficient to lure a number of the young, underemployed farm population to jobs in growing crafts and industry. Better labour productivity across sectors due to technical progress, incomes and savings of farm and manufacturing employees initiates the virtuous circle of economic growth and development. During this process, the labour migration from farms to factories (and later services) continues until the farm sector employs a tiny fraction of the labour force in all mature industrialised countries. Inter-sectoral shifts of employment in the way postulated by Lewis can thus be considered an inevitable concomitant phenomenon of economic development. From the ensuing, we investigate which sector is commanding growth and where labour has been migrating over the years in the selected case countries.

The next section of this paper presents a brief overview description of the economies of the selected countries. Section 3.3 presents a stylised description of the classical Lewis structural change model. Section 3.4 examines the productivity levels of the sectors. Following this is a further presentation of results from data analysed on changing trends sectoral contribution to national income (section 3.5), employment (section 3.6), and employment and value addition gap (section 3.7). The last section of

the chapter presents a summary and conclusions with hints on possible policy implications.

3.2 An overview of selected economies

Ghana is the first country in SSA to gain independence (1957) and quickly become a centralized planned state. There were a series of military coupes and fragile political regimes after the overthrow of the first head of state, in 1966. Presently, Ghana is a democratic state.

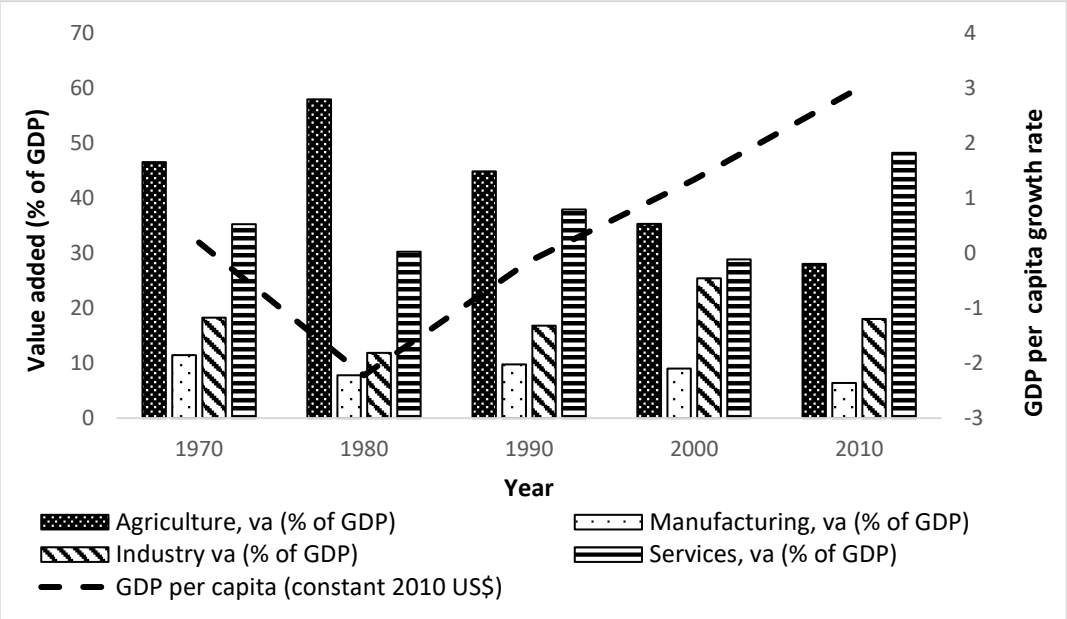
Ghana's economic progression post-independence evolved from reliance export of natural resources (e.g., Cocoa, gold and timber) to import substitution industrialisation (ISI) with a significant intervention of the government in the market. As such, state-owned enterprises (SOEs) in agriculture and industries were established (Steel, 1972). Incomes were high but then, declined in the 1970s and early 1980s (Figure 3.2). Ascribed to this were; macroeconomic disequilibria and austerity measures against public deficits inflected by costly state initiatives (Osei & Jedwab, 2016). The renewed growth was after the structural adjustment programmes (SAP) (1983 and 1987).

In the decades, agriculture has been the major push of economic growth until after 2000. Even after the SAP programme, manufacturing in Ghana has not been able to attain the level of contribution to GDP recorded in the 1970s. The sector is in a steady decline. The industrial sector saw improvement after 1980 but shrunk after 2000. The services sector has been a booster of economic growth after the substantial decrease in agriculture's contribution.

A variety of crops are produced in Ghana depending on the agro-climatic zone. Ghana's cash crops are cocoa, oil palms, cotton, rubber, and tobacco. The major food crops are maize, cassava, and yams. Besides these are aquatic freshwater (e.g. tilapia) and, marine animals (e.g. tuna), livestock, and timber. Crop production and other aspects of agriculture are mostly labour-intensive due to the limited use of technology and slow agricultural mechanization (Diao, Cssar, et al., 2019). In Ghana, the position of industrialisation that includes manufacturing, public utilities, mining and construction prompted disproportionate public investment in the 1960s and 1980s (as in the case of ISI). Employment and GDP shares increased but did not march investments into the sector. The decline in per capita income after 1976 resulted in the contraction and drop in productivity of the manufacturing sub-sector (Osei & Jedwab, 2016). Manufacturing has majorly remained in small, informal units. As of 2010, about 85 percent of total manufacturing jobs were in the informal sector (Diao & Hazell,

2019). The services sector has been the fastest-growing sector in Ghana. Most of the growth has been in trade and personal services -dominated by small informal enterprises. The services sector growth in Ghana has not been a result of only rapid urbanisation but also increased service delivery in small and medium-sized towns (Diao & Hazell, 2019).

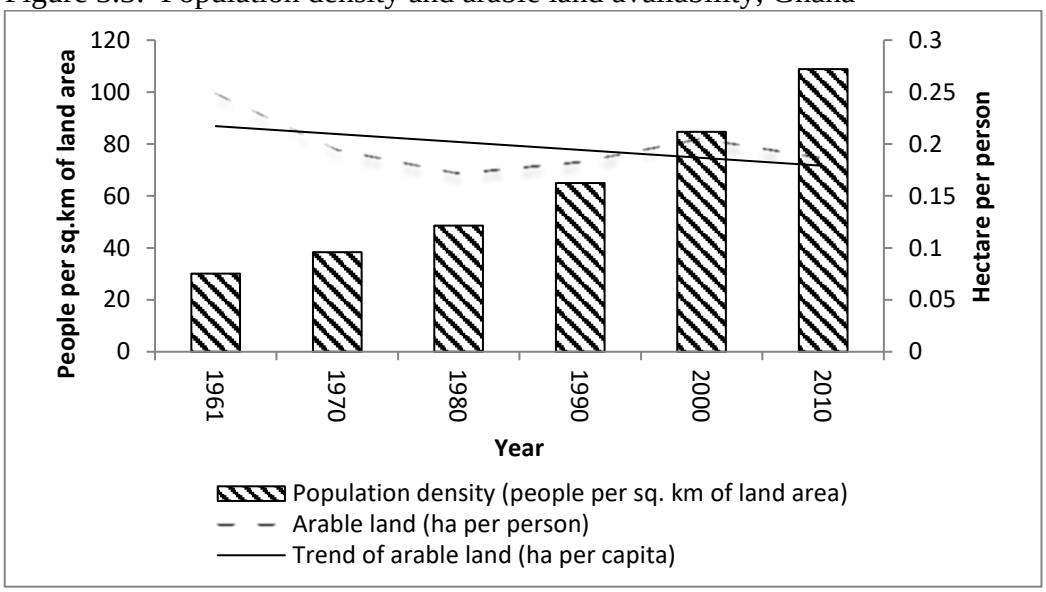
Figure 3.2: Economic changes in Ghana



Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

Ghana's arable land which used to be relatively abundant is gradually declining due to population pressure (Figure 3.3). The increasing population pressure and decreasing land-to-labour ratio in Ghana has forced many farmers to remain in the low-productive food production sector (Breisinger et al., 2011; Diao & Hazell, 2019).

Figure 3.3: Population density and arable land availability, Ghana

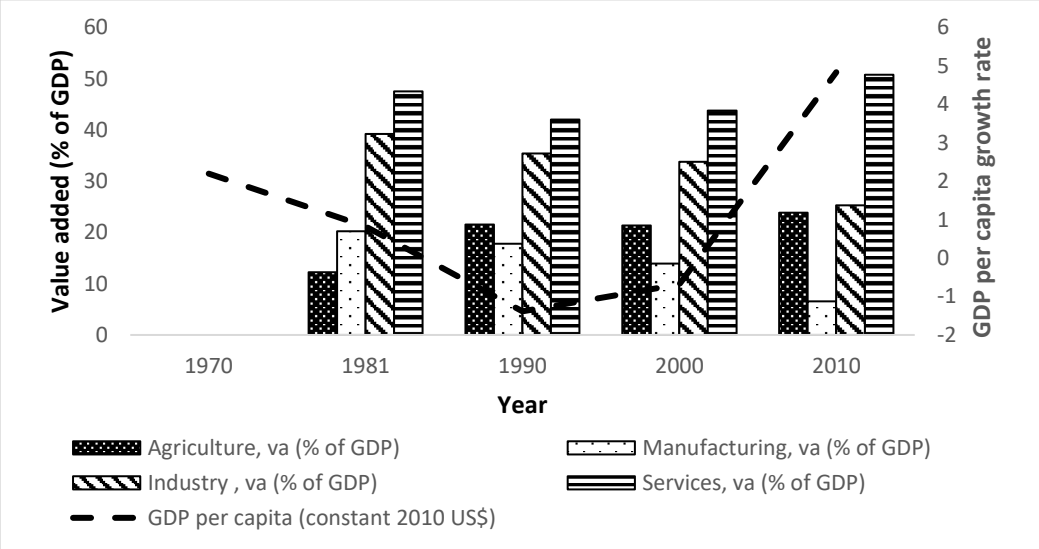


Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

Nigeria has a similar political economy to Ghana, having been colonised by Britain with initial stable civilian governance in 1960 after independence which was marred with military interventions from 1965 onwards till 1999 when there was civilian democratic governance (Ajayi & Ojo, 2014).

Continuing from the pre-colonial era, Nigeria historically relied on varieties of primary commodities for exports which capitalised on regional differences. For instance, peanuts (groundnuts), cotton and hides were sourced from the north, and cocoa, palm oil and timber were from the south. In addition, gold and coal are mined in Nigeria (Ojedokun, 1972). The discovery of commercial quantities of oil in 1965 shifted focus to developing Nigeria majorly from oil revenue. Like Ghana, Nigeria engaged in an import substitution strategy but failed in the long run (Adejugbe, 1995). The size of agriculture to the national income became small as services, and industry (manufacturing) became larger even during the worse economic growth in Nigeria's history (Figure 3.4). Nigeria's woes with oil were not only a Dutch disease but inefficiencies and corruption in managing its oil windfalls (Sala-i-Martin & Subramanian, 2013). After a renewed growth in the early years of 1981, agricultural share to GDP improved.

Figure 3.4: Economic changes in Nigeria

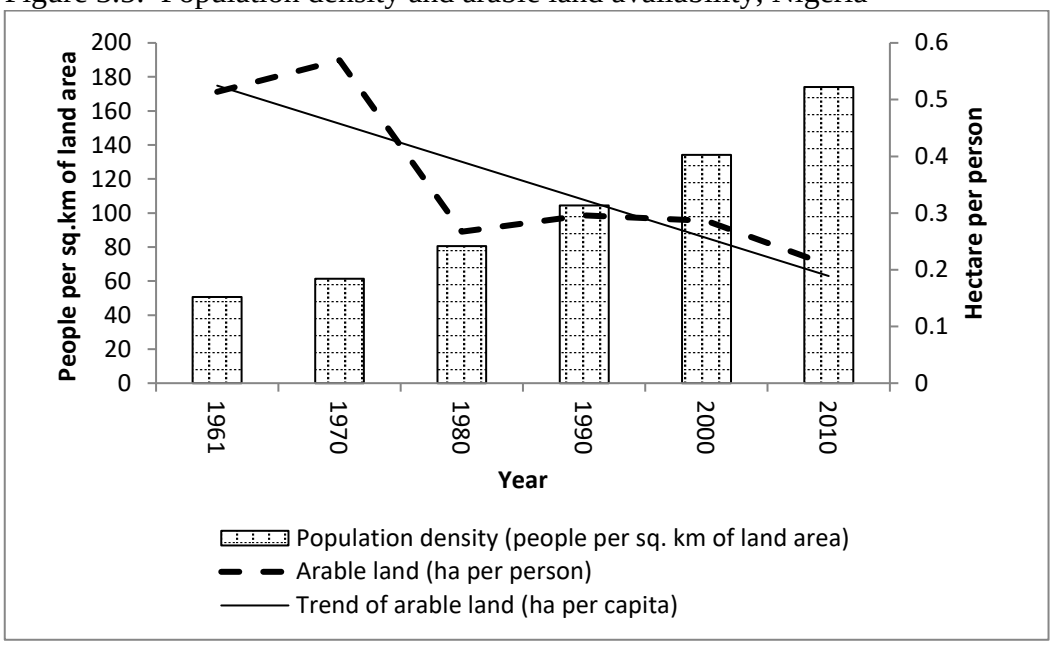


Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

In the decades, industry share in GDP has declined as services share in GDP improved beyond the level in 1981. Likewise, the manufacturing sector has declined in successive decades. Successive Nigerian governments have used oil revenue to increase labour absorption into government public services and the manufacturing industry. Growth in private services led by trade and commerce with a swelling government services sector increased the size of the services sector. However, the private manufacturing sub-sector could not adequately complement to raise industrial growth significantly (Sala-i-Martin & Subramanian, 2013). The collapse of the world oil market meant a significant decline in the manufacturing sub-sector since there were not enough oil windfalls to support the manufacturing sector (Anyanwu, 2000). Prolonged macro-economic challenges, albeit much more liberalisation (e.g. SAP in 1985), could not improve the size of the industrial sector of the economy (Alos, 2000; Banjoko & Bagshaw, 2012).

Nigeria is one of the most land-abundant and populous nations in Africa. It has a total landmass of 924,768 sq.km with a population of 200 million and an annual population growth rate of 2.6% (World Bank, 2020). The increasing population implies that over the decades, the land becomes less available per person (Figure 3.5). Arable land availability per person has steeply declined over the decade while population density increased.

Figure 3.5: Population density and arable land availability, Nigeria



Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

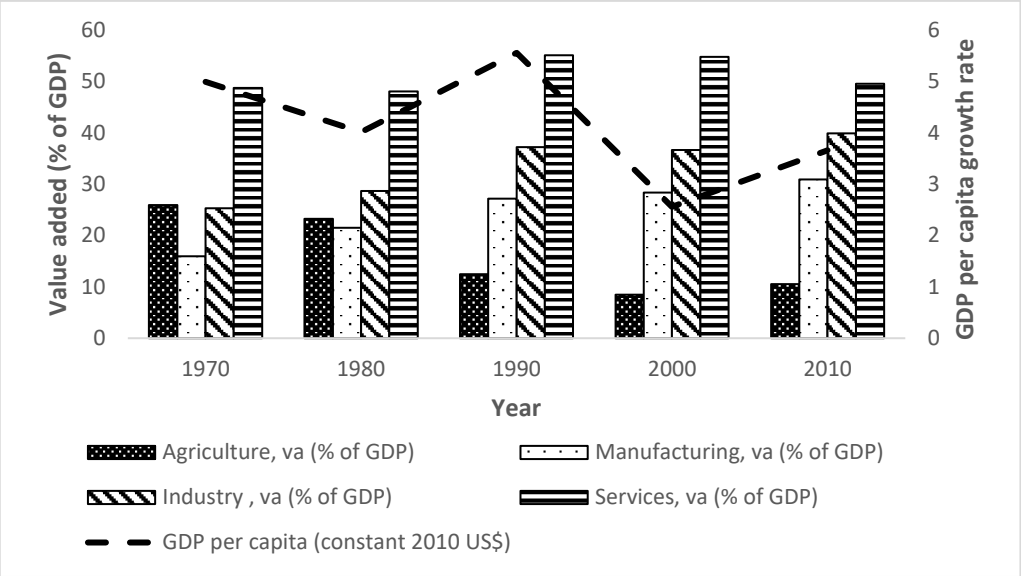
Thailand and Vietnam started their industrialisation as developmental states that engineered a transition from agrarian economies or island trading centres to industrial economies through industrial policy (e.g. see Evans, 1995). Their political and institutional characteristics were less democratic that endured for a longer time, at least up to the take-off in the transition process (see Chang, 1996; Haggard, 1990; Wade, 2003).

Thailand has had a checked economic growth over the decades. The highest per capita growth rate in the decades occurred in 1990 and declined in the succeeding decades (Figure 3.6). In the decades, industry and manufacturing share in GDP has increased as services, although leading, reached their peak in 1990.

The country has adopted development practices that have succeeded economically and lifted it from an agrarian to an export-driving economy (Kelly et al., 2012). The modernisation of Thailand's economy started with a promotion of agricultural production for export accompanied by increased industrialisation and a move towards an export-oriented economy investment in infrastructure; and the strengthening and centralising of public administration (Darlington, 2000; Muscat, 2016). In addition to the services sector developing with other sectors –that is organic, Thailand diversified its economic base into tourism, health care, and other services. Many of Thailand's

enterprises have integrated successfully into the global value chain (Moore & Donaldson, 2016; World Bank, 2016). The food processing industry, for instance, picked and aided to shove up the manufacturing and the broader industrial sector over the decade.

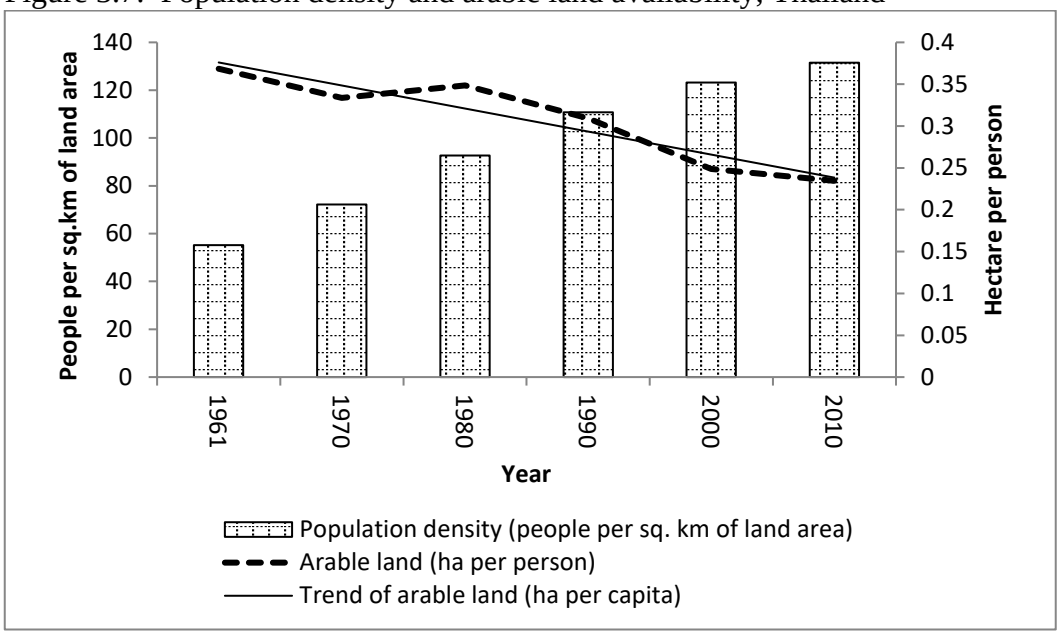
Figure 3.6: Economic changes in Thailand



Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

Rice has been one of the main crops grown and exported in Thailand. Other major crops grown include sugarcane, rubber, cassava, cashew nuts, mango and tobacco. Due to the expanse of available water bodies, they are supplying the world with fishery products. It has a total landmass of 514,000 sq.km with a population of 67 million and an annual population growth rate of 1.5% (1970-2010) (World Bank, 2020). As a result of the increasing population and other competing uses of land, less and less agricultural land is becoming available per person (Figure 3.7). Over the decades, there was a decline in arable land availability per person while population density rose.

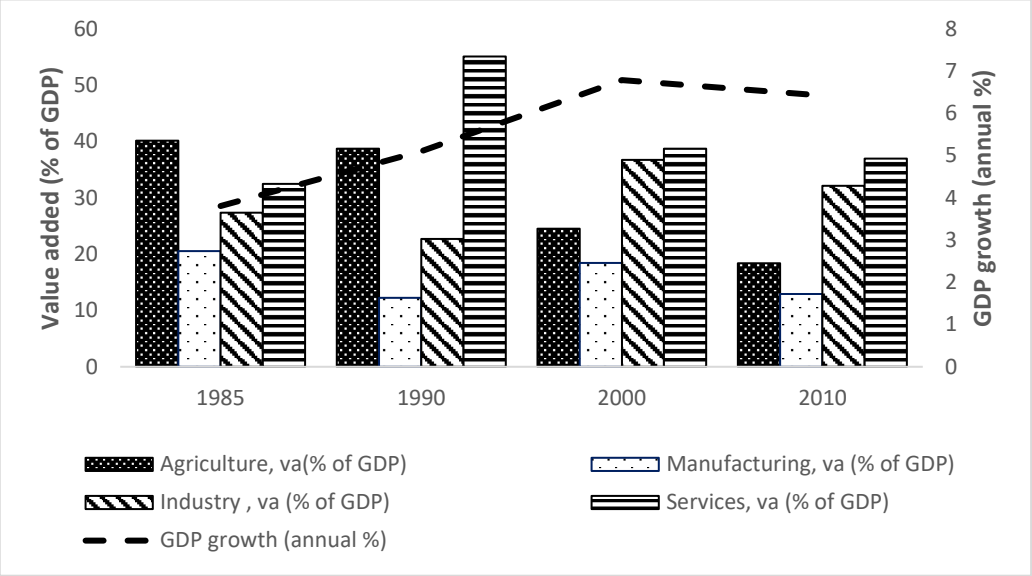
Figure 3.7: Population density and arable land availability, Thailand



Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

The communist government of **Vietnam** was in isolation until 1986 when it initiated a series of economic reforms. The success of the reform translated into higher decades of economic growth (Figure 3.8). The principal strategy of the "doi moi" ('renovation') economic reform programme has been rapid integration into the world economy, with a diversified portfolio of exports and the attraction of direct foreign investment. It diversified its oil, manufactured and agricultural export. State-owned enterprises continued to play a role while growth in the private sector was encouraged (Thoburn, 2009). The policy resulted in significant services sector contributions to GDP over the decades. The sustained state planning and involvement in its industrialisation pre- and post-reform also set the industrial sector, including manufacturing, to contribute meaningfully to its economy over the decade. In the last two decades, services and industries have been the major sectors contributing to economic growth.

Figure 3.8: Economic changes in Vietnam

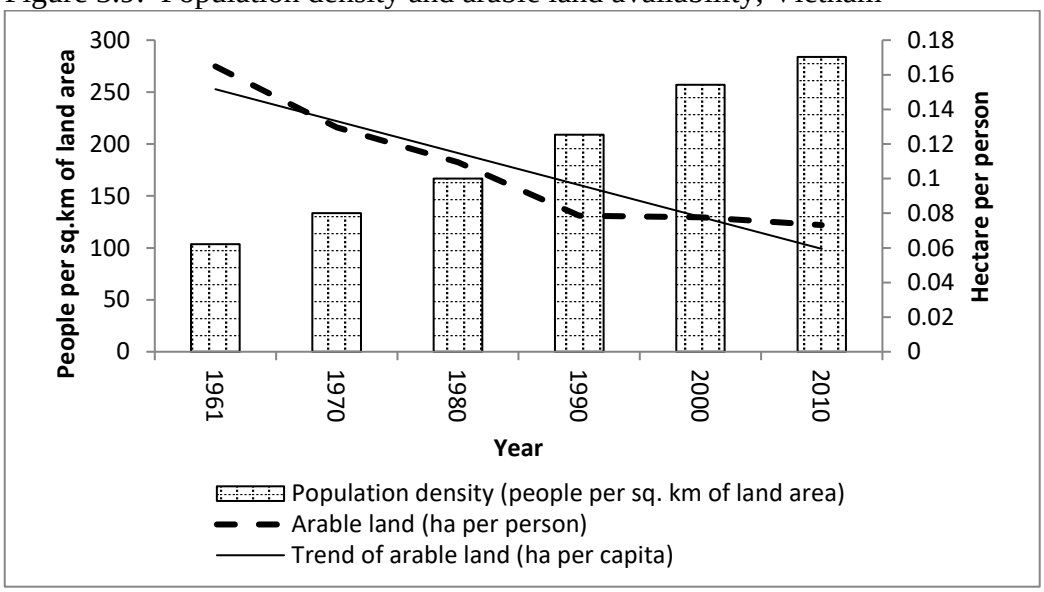


Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

Vietnam has a similar agricultural crop product range as Thailand. Rice is the most important crop in terms of consumption and export in Vietnam. Other food crops cultivated are sugarcane, cassava, maize, sweet potatoes, and nuts. Rubber is a major cash crop. Besides these are the aquatic export of shrimps, squids, octopuses, and tilapia (Phuong & Minh, 2005).

The land area of Vietnam is 331,689 sq.km inhabited by a population of over 87 million (in 2010) and a population growth rate of 1.8 percent (1970-2010). In recent decades, Vietnam has been one of the most densely populated states in the SEA. The number of people on a square kilometre of land increased by about 284 persons (in 2010) (Figure 3.9). In line, arable land per person reduced sharply until 1990, after which there was a gradual reduction.

Figure 3.9: Population density and arable land availability, Vietnam



Source: World Bank (2020). World Development Indicators (WDI). Accessed 19.05.2020, ULR: http://databank.worldbank.org/data

3.3 Lewis's concept of economic development

The classical Lewis economic development model focuses on structural change and the inter-sectoral migration of labour. Further elaboration of this model is done by other scholars such as Ranis & Fei, (1961), and Harris & Todaro, (1970). The Lewis model is particularly useful in understanding the growth experience in China (e.g. Xu, 1994 and Yao, 2000).

The model views an economy as consisting of two sectors, here referred to as a dual economy, a traditional subsistence sector characterized by zero to negligible or even negative marginal labour productivity (MPL_t), and a higher marginal labour productivity (MPL_m) modern capitalist sector[1]. In the course of economic growth, labour migrates from the traditional/agriculture sector to the modern capitalist (manufacturing, services) sector. In essence, the outmigration of surplus labour will not significantly affect the output level of the traditional sector due to corresponding productivity growth (Wang & Weaver, 2013; Lewis, 1954). Labour-saving technology (machines) and or farm population growth under constrained resources in the farm sector explain the emergence of surplus labour in the traditional subsistence sector (the rural agricultural economy). The modern sector (industrial or service sector), often

[1] The capitalist sector is characterized by the use of reproducible capital and pay for its use, while the subsistence sector uses non-reproductive resources and usually does not pay the market value for it (Lewis, 1954).

offers higher wages or incomes, which incentivize inter-sectoral as well as also rural-urban migration (Wang & Weaver, 2013; Harris & Todaro, 1970; and Lewis, 1954).

Theoretically, profit-maximizing firms in the competitive industrial labour market employ up to the point where the wage rate (W_m) equals the marginal product of the industrial sector (MPL_m) (thus, $W_m = MPL_m$). And in addition to the assumption of surplus labour, Lewis also assumed that all rural workers share equally in the output such that wage is determined by the average and not the marginal product of labour as in the case of the modern sector. This implies that their wage levels (W_t) are above their marginal productivity (MPL_t) (thus, $MPL_t < W_t$) (Todaro and Smith, 2015). Under a dual economy system, the relationship $MPL_t < W_t < W_m = MPL_m$ is observed. This enables the modern sector to employ labour from the traditional sector without the need to increase the wage for some time (Lewis, 1954; Todaro & Smith, 2014).

The practical implication of this model is that, as an economy grows, the farm sector in an industrializing country will shrink, and surviving farm enterprises will have to increase in size and productivity to stay competitive (Johnston, 1970). The greater implication on the rural labour market is that labour demand shifts towards fewer but better-qualified employees in the farm sector with time. The resulting surplus labour from the farm sector then has to look for employment in other sectors of the economy. Lewis (1954) assumed that this surplus labour force would find employment mainly in the manufacturing sector although this assertion may underestimate the absorption potential of services. Growth in the manufacturing and services sectors will expectedly increase demand for raw materials from the agricultural and forest sector.

Growth in the industrial sector occurs when capital owners re-invest their profits (savings) into the expansion of their productive capacities. This gives room for greater absorption of labour from the traditional subsistence sector without necessarily increasing wage levels (Lewis, 1954). Still, the industrial sector in a growing economy usually can offer real wage levels above the subsistence wage level and thus incentivise outmigration from the farm sector. How this model has played out in the economies of SSA and SEA is investigated in the remainder of this chapter.

3.4 Sectoral productivity

This section uses data from the world development indicators (WDI) to provide an economy-wide performance analysis of the sectors. Tables, charts and diagrams are used for illustrations. The two-sector model predicts the role of sectoral productivity differences in the structural change process. The model implies that productivity growth in the modern sector is alluring to labour migration from the traditional

agricultural sector. Available data on value-added per worker clearly show the productivity level of sectors at a time as well as changing patterns over time (Tables 3.1 and 3.2). Table 3.1 shows that in the SSA region, the productivity level of agriculture has been low but growing at an annual rate of 7.10 percent in Ghana and 5.16 percent in Nigeria for the past decade (the year 2008 to the year 2018). The productivity level of the industrial sector in Ghana has been increasing in recent years (counting from 2010 onwards) above that of the services sector. In line, the rate of growth of productivity in the industrial sector in Ghana has been 2.83 percent more than that of the services sector. This finding presents the industrial sector as an alternative source of employment for underemployed agricultural labour. In Nigeria, the industrial sector value added per worker has been above that of the services sector throughout the year-on-year observation period. However, while the industrial sector's labour productivity growth rate declined by about 0.52 percent, the service sector grew at an annual rate of 3.31 percent in the last decade. Growth rates are more of a matter of policy and economic circumstances that have persisted over the years.

Table 3.1: Sectoral value added per worker (constant 2010 US$) in Ghana and Nigeria

Year	Ghana			Nigeria		
	Services	**Industry**	**Agric.**	**Services**	**Industry**	**Agric.**
2008	4190.54	3904.45	1590.28	6430.05	16636.95	3702.00
2009	4168.55	4048.42	1702.03	6915.11	16957.89	3896.88
2010	4298.70	4245.48	1797.78	7459.76	17549.96	4104.22
2011	4416.39	5809.08	1845.80	7485.98	18723.88	4195.20
2012	4682.63	6281.00	1916.28	7853.04	18086.59	4673.01
2013	4888.90	6551.23	2055.25	8595.05	17383.23	5044.21
2014	4732.09	5659.40	2289.17	9006.21	18086.69	5328.38
2015	4507.82	4876.67	2644.93	9184.39	17147.42	5508.87
2016	4361.13	4771.80	2727.74	9196.59	15865.88	5880.70
2017	4266.10	5065.12	2940.51	8916.49	15957.96	6082.18
2018	4223.78	5200.29	3158.87	8735.38	15781.93	6123.13
Average growth rate	**0.08**	**2.91**	**7.10**	**3.11**	**-0.53**	**5.16**

Source: WDI database (2020)

In similarity to SSA, the countries in SEA recorded low levels of productivity in the agricultural sector and high productivity levels in the industrial sector throughout the

years (Table 3.2). One delineating observation from the SSA countries is the near levels of productivity growth rate in the economic sectors in the SEA countries over the decade. There is consistency in the growth performance of the services and industrial sectors in the selected countries. As such, the agriculture sector experienced the highest annual rate of growth (3.54% in Vietnam and 3.00% in Thailand) over the past decade. This is followed by the services sector (about 2.40 % in Vietnam and 2.97% in Thailand) and the industrial sector (about 1.54% in Vietnam and 1.43% in Thailand).

Table 3.2: Sectoral value added per worker (constant 2010 US$) in Vietnam and Thailand

Year	Vietnam			Thailand		
	Services	**Industry**	**Agric.**	**Services**	**Industry**	**Agric.**
2008	2977.02	3829.56	882.23	10576.13	15537.13	2375.02
2009	3071.73	3836.26	903.70	10101.39	15315.40	2382.67
2010	2853.40	3390.24	863.08	10605.41	17085.06	2425.87
2011	2931.28	3648.70	890.25	11125.34	16916.91	2338.66
2012	2977.97	3872.87	919.99	12518.79	17766.94	2332.55
2013	3056.33	3984.95	935.15	12895.64	17252.49	2552.99
2014	3179.72	4132.61	964.13	12073.37	15628.01	3035.69
2015	3261.63	4252.22	1034.42	12441.10	16019.80	2947.90
2016	3459.51	4182.37	1097.39	12786.88	16578.50	3037.66
2017	3602.99	4293.69	1164.98	13445.75	17598.42	3139.77
2018	3773.30	4462.60	1248.93	14167.94	17902.12	3190.75
Average growth rate	**2.40**	**1.54**	**3.54**	**2.97**	**1.43**	**3.00**

Source: WDI database (2020)

The sectoral productivity performances show an apparent uniformity in the growth and transformation process in countries of SEA than that of SSA. However, most of the time, the industrial sector had the highest labour productivity. In the thought of theory, the findings imply that the industrial sector (a traditionally highly productive sector) will firstly employ labour from agriculture before the services sector. Another observation is the relatively higher average productivity growth in the agricultural sector as compared to other sectors in both regional economies. This is expected from the theory which suggest productivity growth in the agricultural sector as part of the driving force of structural change. In the following the contribution of economic

sectors to income and employment is examined to trace structural transformation process in the economies.

3.5 The changing trends in sectoral value addition to national income

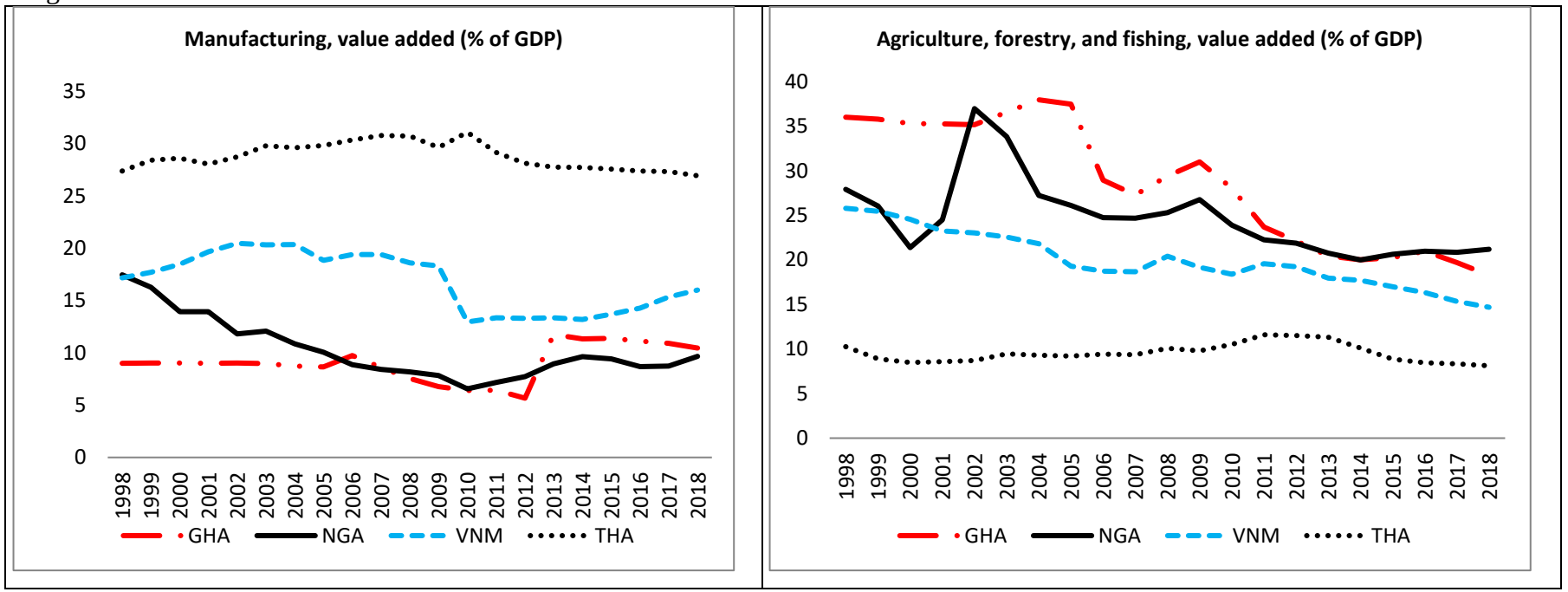
Figures 3.10a and b investigate the sectoral contribution to national income. The results show a clear trend in the changing contribution of the sectors to the gross domestic product over time across the countries. Value-addition from the manufacturing sub-sector in Vietnam (VNM) and Thailand (THA) is higher than that of Ghana (GHA) and Nigeria (NGA) in the last two decades (1998-2018). Nevertheless, Ghana is the only country that has experienced an annual growth rate of 0.76 percent. The annual growth rate of manufacturing contribution to GDP declined in the economies of Vietnam (0.35%), Thailand (0.08%) and Nigeria (2.92%) from the year 1998 to 2018.

Both SEA and SSA countries showed a declining pattern in agricultural value addition. Ghana, Nigeria, and Vietnam started with relatively high agriculture value-added. In recent years, however, they are converging to the level of value addition of Thailand. Over the past two decades, the annual growth rate of agricultural value addition from Ghana and Vietnam declined by the highest of about 3.34 and 2.78 percent.

Although Vietnam and Thailand have had increasing and higher industry value added in most of the years than Ghana and Nigeria, Ghana in recent years (2010 onwards) has had an impressive growth trend. The growth rate of industry value added to the Ghanaian economy has been about 1.11 percent in the last two decades. Industry value-addition to the economy of Vietnam also grew at a rate of 0.26 percent. The growth rate of industry value added in the economy of Nigeria and Thailand however, declined by 0.54 and 0.18 percent between the years 1998 and 2018.

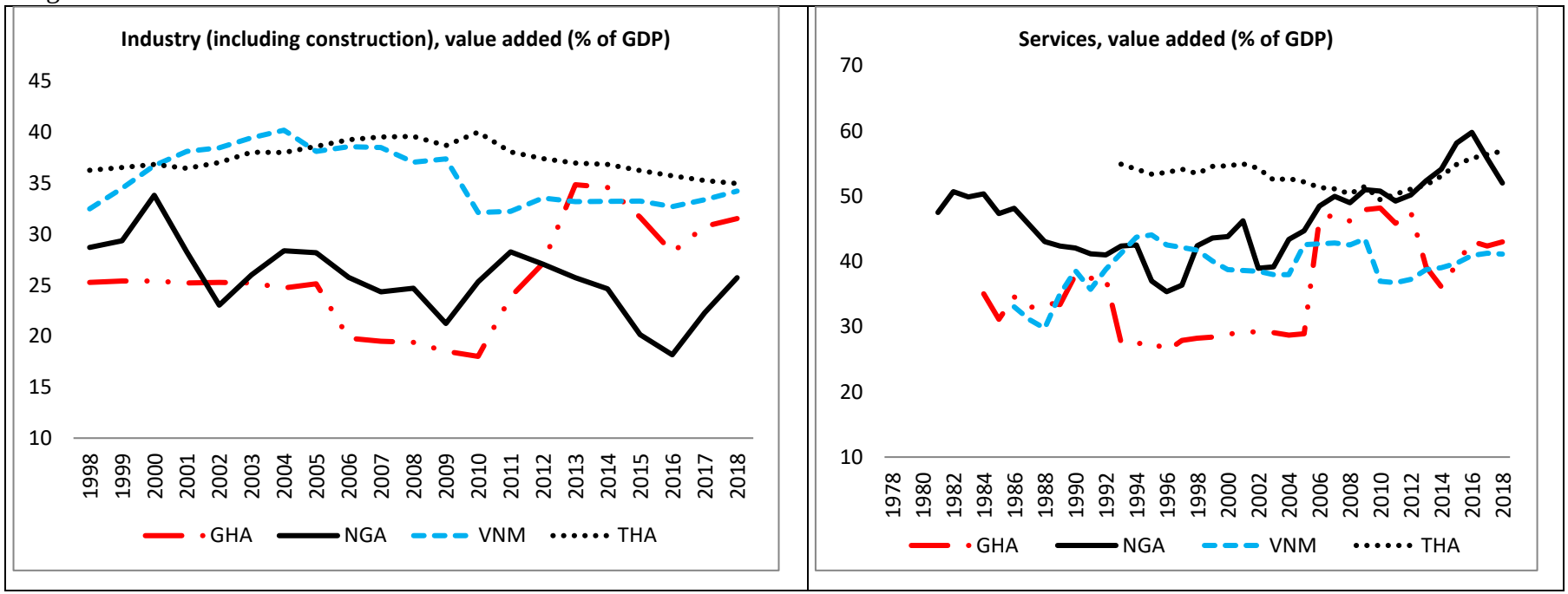
The services sector's contribution to GDP in all the countries except Vietnam steadily increased over the years. In the past two decades, service value added to the economy of Vietnam decreased by 0.07 annually. Ghana has had the highest annual growth rate (2.13%) in the services sector for the past two decades. This is followed by Nigeria (1.03%) and Thailand (0.31%).

Figure 3.10a: Trends in sectoral contribution to GDP in SSA and SEA countries[4]



Source: WDI database (2020)

Figure 3.10b: Trends in sectoral contribution to GDP in SSA and SEA countries



Source: WDI database (2020)

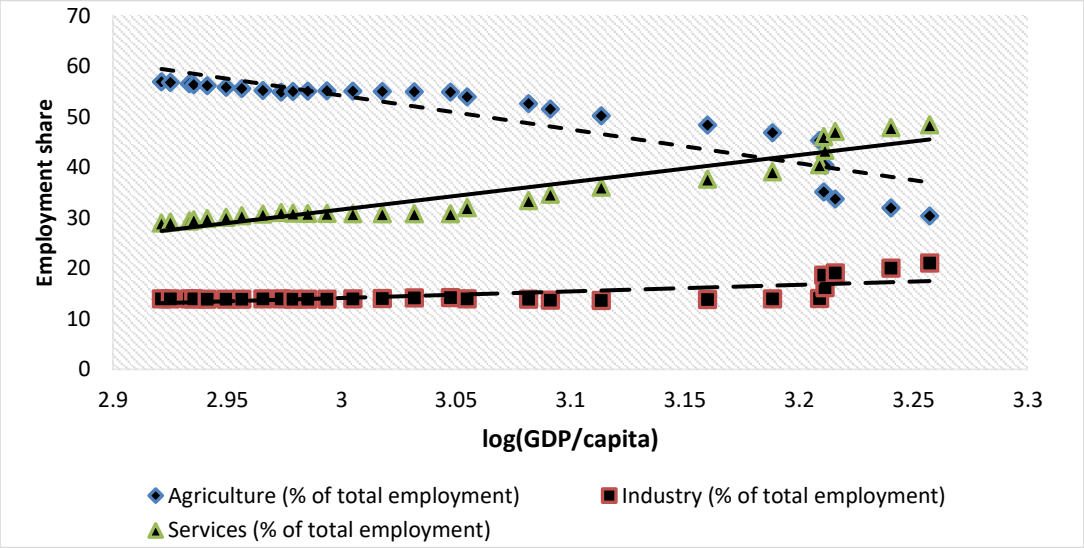
[4] The proportion of value addition from the sectors in each chart does add up to 100%. This is because the sector contributions are picked from individual country economies and presented on sector-specific charts for a cross-country comparison. For instance, a chart on manufacturing value added comprised of the shares of percentage contribution pooled from Ghana (GHA), Nigeria (NGA), Vietnam (VNM), and Thailand (THA).

In summary, while agricultural contribution to GDP in all the countries has been decreasing for the selected countries in the economic block, the services sector shows a higher and increasing trend in value-addition. Value addition from other sectors hangs in to augment the shortfall in the replacement capacity of the services sector. The SEA countries have relatively more vibrant manufacturing and industrial sectors than SSA countries in terms of value-addition contributions.

3.6 The changing relationship between employment, and income

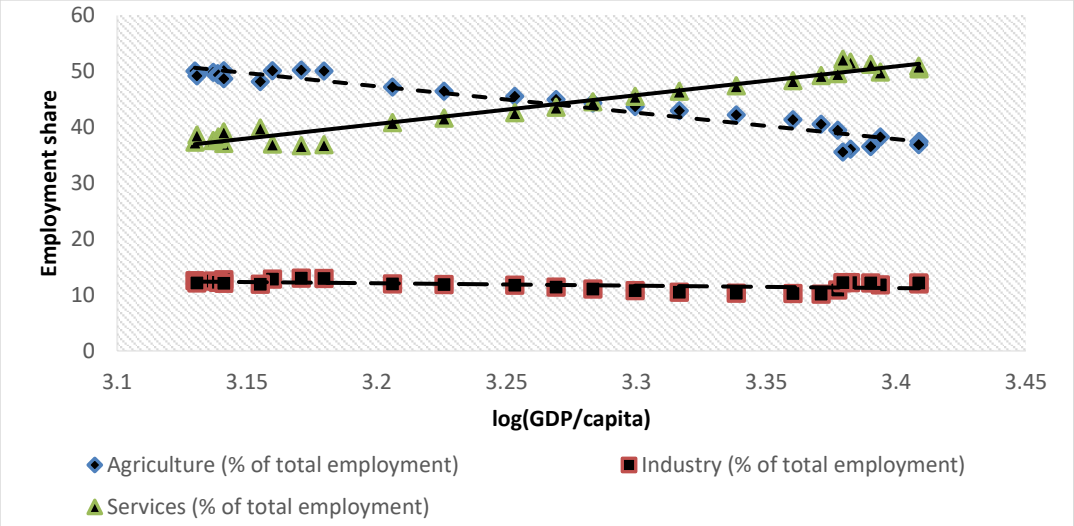
To investigate the relationship between employment and growth in national income, the natural logarithm of GDP per capita is used as a proxy for economic growth. The share of employment in agriculture has been decreasing with increasing GDP per capita for both African countries (Figures 3.11a & b). Within the same time frame (1991 to 2018), Ghana started with a relatively higher share of the employed in agriculture (about 57%) than Nigeria (about 50%). As the economies grew, employment contributions from agriculture dropped in both countries. Ghana had a faster rate of decline (about 2% annually) than Nigeria (about 1% annually). The employment contribution from the services sector grew almost at the growth rate of the decrease in employment growth in Ghana and Nigeria. The results showed a steady trend of growth in the share of employment in the industrial sector with the economy in Ghana. In Nigeria, the employment share in the industry has been slightly decreasing with increasing economic growth.

Figure 3.11a: Trends in sectoral share of employment and GDP per capita (constant 2010 US$) in Ghana (1991-2018)



Source: Estimates from WDI database (2020)

Figure 3.11b: Trends in sectoral share of employment and GDP per capita (constant 2010 US$) in Nigeria (1991-2018)

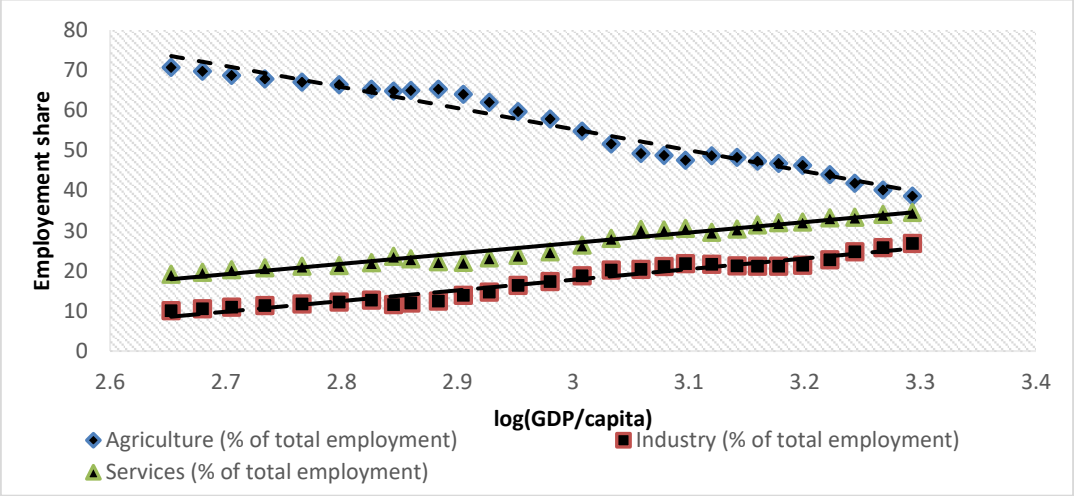


Source: Estimates from WDI database (2020)

In the case of SEA countries, the share of employment in the industry sector responded well to growth in GDP per capita than in SSA countries (Figures 3.12a & b). In

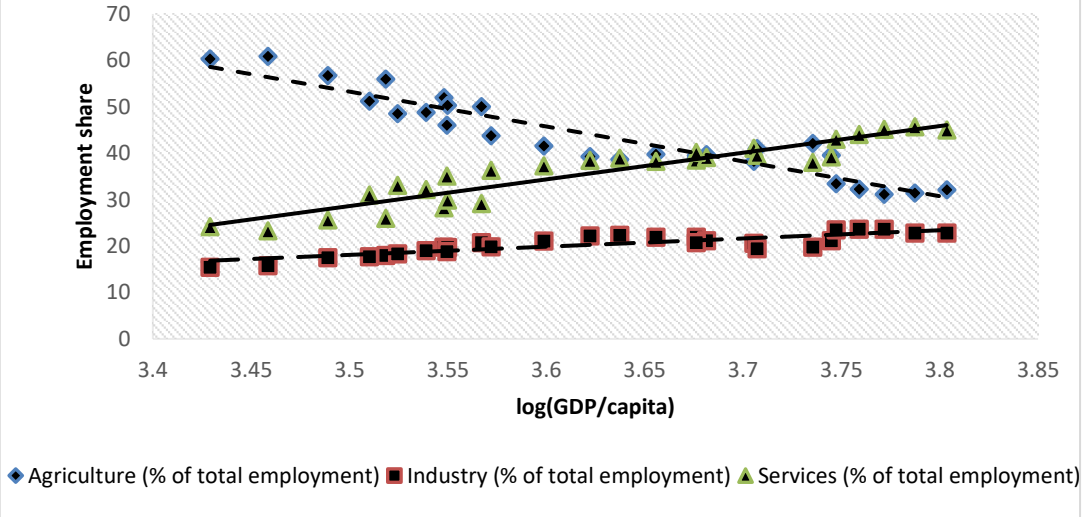
particular, the industrial share of the employed in the Vietnamese economy increased almost parallel to the increase in services.

Figure 3.12a: Trends in sectoral share of employment and GDP per capita (constant 2010 US$) in Vietnam (1991-2018)



Source: Estimates from WDI database (2020)

Figure 3.12b: Trends in sectoral share of employment and GDP per capita (constant 2010 US$) in Thailand (1991-2018)



Source: Estimates from WDI database (2020)

Economic transformation generally goes hand in hand with labour migration from the agriculture sector (low-productive sector) into better-paying/highly productive sectors.

The classical development economics theory on structural change assumes the productive sector to be the manufacturing sector. It observes that a structural change in the early stages of development occurs with productivity growth in the industrial sector which draws labour from the agricultural sector –where productivity is low (Grabowski, 2015). The findings and forecasts of this study suggest that most labour migration from agriculture goes into the services sector. An implication is that the services sector is relevant in the modern development process in the SSA.

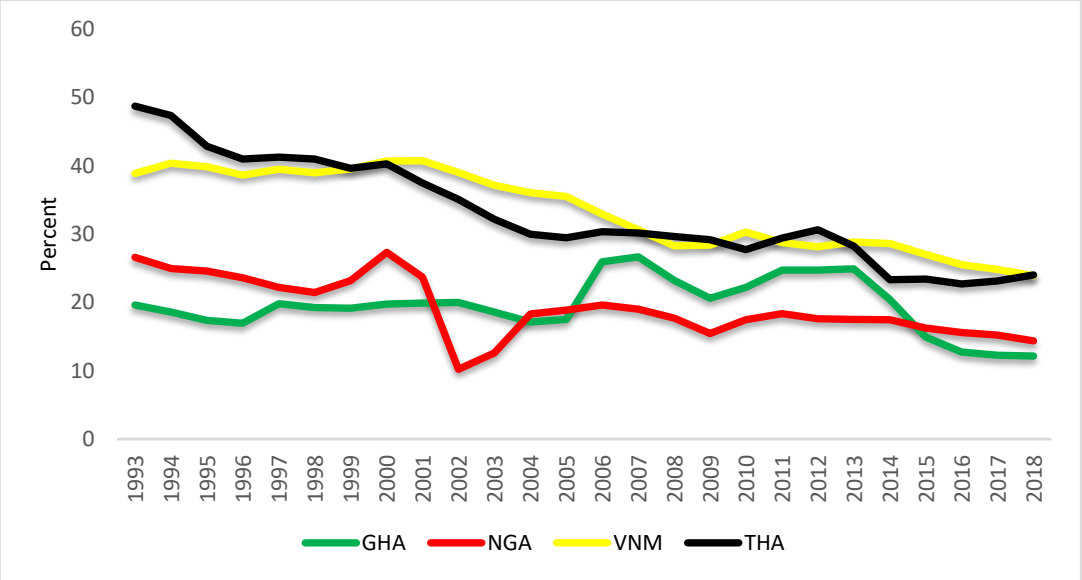
3.7 The changing gap between employment and value-added (GAP)

The previous section showed the incidence of structural transformation in the SSA and SEA regions. It further unravelled that the agricultural sector's productivity for SSA is low but improving (a higher average growth rate over the period, see section 3.4). However, value addition and employment contribution to national accounting declines as the industrial and services sectors increased at varying degrees. Since the productivity of the agricultural sector is low, the share of agriculture value addition starts to decline faster than its share in employment. The resultant difference/structural gap is referred to as the GAP in this section (Seema et al., 2019).

3.7.1 GAP for the agricultural sector

The GAP is a structural change indicator, defined as the difference between the share of agriculture in employment and valued-added (Seema et al.,2019). It indicates the labour productivity difference between agriculture and non-agricultural sectors. Figure 3.13 shows a declining trend in the GAP in all the countries. Vietnam and Thailand had a higher GAP than SSA countries, but in recent years, the GAP has declined and converged to the level of the SSA countries. This means SEA has been more successful in increasing relative agricultural labour productivity over time, which means that structural change in SEA is happening at a faster pace.

Figure 3.13: GAP of the agricultural sector in SSA and SEA countries, 1991-2018 in percentage



Source: Estimates from WDI database (2020)

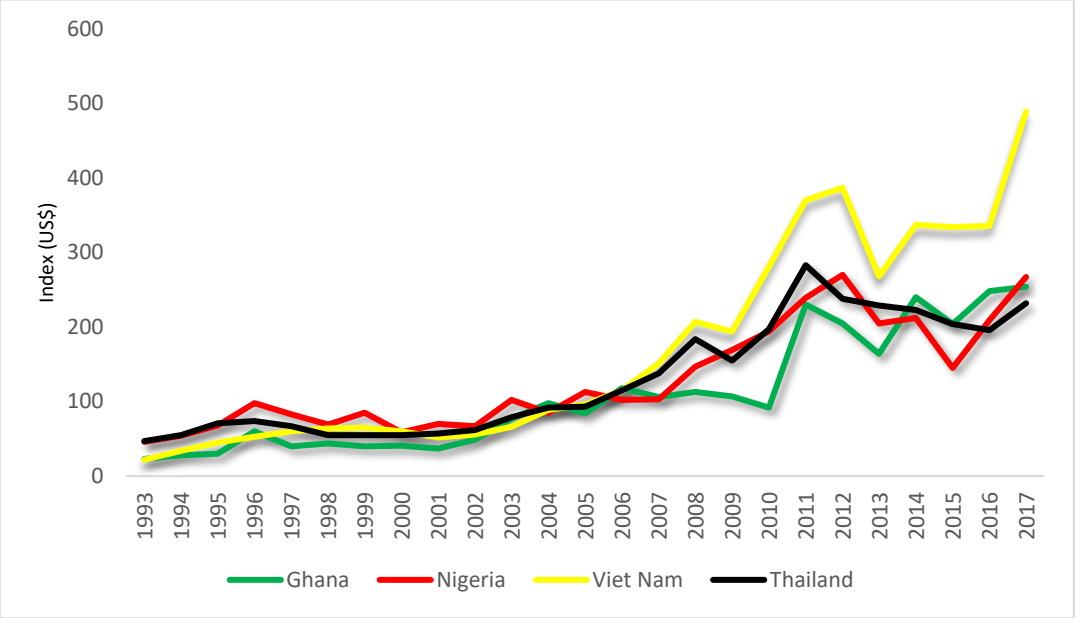
Reduction in the GAP could signify increased commercialisation of the agricultural sector by investing in high-value crops which generate enough revenue through export. This reflects in an increasing trend of the export value index[5] for agro-products (Figure 3.14).

Ghana and Nigeria are among the key producers of internationally traded agricultural commodities such as cocoa, and oil palm. Vietnam and Thailand have a wide range of exportable agro-processed products such as cut fruits and vegetables, nuts and seeds. The gains in agricultural export and the rising importance of other sectors in creating employment increase the marginal product of labour in the agriculture sector, contributing to a decreasing trend in GAP. Also, a reduction in GAP could signal that the rate of out-migration of agriculture labour compared to value addition is high. This comes about by structural changes that move "surplus" labour in the agricultural sector to other productive sectors. Those that remain in the agriculture sector become more productive and increase the value of agricultural production. Finally, investments in technologies that reduce dependency on agricultural labour also cause GAP to decline.

[5]Value indices represent the change in the current values of Export f.o.b (free on board) all expressed in US dollars.

Source: FAO Statistics Division

Figure 3.14: Export Value Index (2004-2006 = 100) for agricultural products



Source: (Food and Agriculture Organization (FAO), 2020)

3.8 Summary and conclusion

This study examined structural transformation in SSA and SEA countries. It specifically looked at the similarities and diversity of structural changes in two countries within SSA (Ghana and Nigeria) and SEA (Vietnam and Thailand).

The analysis revealed that countries in both regions made progress in a structural transformation process in the perspective of changes in sectoral labour productivity, value-added, employment, and GAP. Generally, the changes observed are seemingly consistent with theory and have been similar to the historical pattern observed in contemporary developed and developing economies.

The time series data on labour productivity level showed a growing trend in productivity across sectors in the economies. In all the countries, the industrial sector had a higher productivity level. The services and the agricultural sectors follow in the respective order. The productivity trend in the industrial sector of SSA countries is much more stunted but with slight increases than the services sector.

Agricultural contribution to GDP in the selected countries of the SSA and SEA region is decreasing as the services sector has generally gained prominence as the highest contributing sector to GDP in all the economies. The manufacturing and industrial sectors are relatively more vibrant in SEA countries than in SSA countries. The SSA

countries have had a rapidly growing services sector. The decline in agricultural contribution to GDP is, therefore, compensated for more by the services sector than the industrial sector.

The share of agricultural labour in the SSA countries decreased almost at the same rate as the increase in the labour share employed in the services sector. The employment share of industry is the lowest in both countries of the SSA region. However, while Ghana experienced a steady trend increase, the employment share of industry in Nigeria decreased steadily as per capita GDP increased. The SEA countries showed a similar characteristic of the interaction of agricultural and services labour share as in SSA. A feature of the SEA country's employment share that delineates from SSA countries is the increasing share of the employed in the industrial sector with economic progress.

The SEA countries showed a steep and decreasing trend in GAP than SSA countries. GAP in the SSA countries is decreasing but at a steady pace. SEA countries are, therefore, more successful at increasing agricultural labour productivity, which implies that structural change is happening at a faster pace in SEA.

In summary, the SEA region outperforms the SSA with an ever-increasing and widening gap. Moreover, the countries in both regions perform quite differently in their economic trajectory, while the SEA countries are transforming through manufacturing and industry; it is not obvious this will be the path for most SSA countries. Depending on resource endowments, labour skills, and other factors, some SSA countries may follow the Asian path through low-wage manufacturing, wherein others may transform through services, and still others through the transformation of their agricultural sector.

Finally, the sub-Saharan African structural change is not exhibiting the pattern of the Asian industrialisers. Labour is migrating more into the services sector -a historically low productive sector than the industrial sector. Hence, the services sector plays a significant role in the structural transformation process of African economies. The structure and nature of the services, and other economic sectors, could provide a suitable framework for labour market improvement and growth paths. The ensuing chapter of this thesis discusses it.

3.9 **References**

Adejugbe, M. O. A. (1995). Macroeconomic Policies and the Industrial Sector. In A. Iwayemi (Ed.), *Macroeconomic Policy Issues in an Open Developing Economy: A Case Study of Nigeria* (pp. 465–496). National Centre for Economic Management and Administration (NCEMA).

Ajayi, A. T., & Ojo, E. O. (2014). Democracy in Nigeria: Practice, Problems and Prospects. *Developing Country Study*, *4*(2), 1–19.

Alos, A. J. (2000). Creating Value Under Uncertainty. *Journal of African Business*, *1*(1), 9–24. https://doi.org/10.1300/J156v01n01_03

Anyanwu, C. M. (2000). *Productivity in the Nigerian Manufacturing Industry By*. Department, Central Bank of Nigeria. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.551.2807&rep=rep1&type=pdf

Banjoko, S., & Bagshaw, K. (2012). *The Performance of the Nigerian Manufacturing Sector: A 52-Year Analysis of Growth and Retrogression (1960-2012)*.

Breisinger, C., Diao, X., Kolavalli, S., Al-Hassan, R. M., & Thurlow, J. (2011). *A New Era of Transformation in Ghana:Lessons from the Past and Scenarios for the Future* (0 ed.). International Food Policy Research Institute. https://doi.org/10.2499/9780896297883

Chang, H. (1996). *The Political Economy of Industrial Policy* (1st ed.). Palgrave Macmillan UK. https://www.palgrave.com/gp/book/9780333588628

Darlington, S. M. (2000). Rethinking Buddhism and Development: The Emergence of Environmentalist Monks in Thailand. *Journal of Buddhist Ethics*, *7*.

http://kusala.online-dhamma.net/%E6%96%87%E5%AD%97%E8%B3%87%E6%96%99/%E5%8D%97%E5%82%B3%E4%BD%9B%E6%95%99%E5%9C%96%E6%9B%B8%E9%A4%A8%20Theravada%20Buddhism%20E-Library/054%20%E9%9B%9C%E8%AA%8C%20Magazine/Journal%20of%20Buddhist%20Ethics/JBE/www.jbe.gold.ac.uk/7/darlington001.html

Diao, X., Cssar, F., Houssou, N., & Kolavalli, S. (2019). Unleashing the Power of Mechanisation. In X. Diao, P. Hazell, S. Kolavalli, & D. Resnick (Eds.), *Ghana's Economic and Agricultural Transformation: Past Performance and Future Prospects* (pp. 1–227). Oxford University Press. https://doi.org/10.1093/oso/9780198845348.001.0001

Diao, X., & Hazell, P. (2019). Ghana's Economy-wide Transformation: Past Parterns and Future Prospects. In X. Diao, P. Hazell, S. Kolavalli, & D. Resnick (Eds.), *Ghana's Economic and Agricultural Transformation: Past Performance and Future Prospects* (pp. 1–227). Oxford University Press. https://doi.org/10.1093/oso/9780198845348.001.0001

Evans, P. B. (1995). *Embedded autonomy: States and industrial transformation*. Princeton University Press.

Food and Agriculture Organization (FAO). (2020). *FAOSTAT*. Food and Agricultural Organisation of the United Nations. http://www.fao.org/faostat/en/#data/QC

Grabowski, R. (2015). Deindustrialization in Africa. *International Journal of African Development*, *3*(3), 51–67.

Haggard, S. (1990). *Pathways from the Periphery:The Politics of Growth in the Newly Industrializing Countries*. Cornell University Press. https://www.cornellpress.cornell.edu/book/9780801497506/pathways-from-the-periphery/

Harris, J. R., & Todaro, M. P. (1970). Migration, Unemployment and Development: A Two-Sector Analysis. *The American Economic Review*, *60*(1), 126–142.

Johnston, B. F. (1970). Agriculture and Structural Transformation in Developing Countries: A Survey of Research. *Journal of Economic Literature*, *8*(2), 369–404. JSTOR.

Kelly, M., Yutthaphonphinit, P., Seubsman, S., & Sleigh, A. (2012). Development Policy in Thailand: From Top-down to Grass Roots. *Asian Social Science*, *8*(13), 29–39. https://doi.org/10.5539/ass.v8n13p29

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *The Manchester School of Economics*, *22*(2), 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

Moore, J. D., & Donaldson, J. A. (2016). Human-scale economics: Economic growth and poverty reduction in Northeastern Thailand. *World Development*, *85*, 1–15. https://doi.org/10.1016/j.worlddev.2016.04.004

Muscat, R. J. (2016). *The Fifth Tiger: Study of Thai Development Policy*. Routledge.

Ojedokun, O. (1972). The Changing Pattern of Nigeria's International Economic Relations: The Decline of the Colonial Nexus, 1960-1966. *The Journal of Developing Areas*, *6*(4), 535–554.

Osei, R. D., & Jedwab, R. (2016). Structural change in a poor African country: New historical evidence from Ghana. In M. S. McMillan, D. Rodrik, & C. Sepúlveda (Eds.), *Structural change, fundamentals, and growth: A framework and case studies* (pp. 161–196). International Food Policy Research. http://dx.doi.org/10.2499/9780896292147_ch4

Phuong, N. T., & Minh, T. H. (2005). *An Overview of Aquaculture Sector in Vietnam*. Cantho University, Vietnam.

Ranis, G., & Fei, J. C. H. (1961). A Theory of Economic Development. *The American Economic Review*, *51*(4), 533–565. JSTOR.

Rodrik, D. (2007). *One economics, many recipes: Globalization, institutions, and economic growth*. Princeton University Press. https://edisciplinas.usp.br/pluginfile.php/4093442/mod_resource/content/0/Rodrik%2C%20Dani%20One%20Economics%20%E2%80%A2%20Many%20Recipes.pdf

Rodrik, D. (2018). An African Growth Miracle? *Journal of African Economies*, *27*(1), 10–27. https://doi.org/10.1093/jae/ejw027

Sala-i-Martin, X., & Subramanian, A. (2013). Addressing the Natural Resource Curse: An Illustration from Nigeria†. *Journal of African Economies*, *22*(4), 570–615. https://doi.org/10.1093/jae/ejs033

Seema, B., Alwin, D., & Joshi, P. K. (2019). *Structural transformation in Southeast Asian countries and key drivers* (IFPRI Discussion Paper 01856; 0 ed.). International Food Policy Research Institute. https://doi.org/10.2499/p15738coll2.133346

Steel, W. F. (1972). Import Substitution and Excess Capacity in Ghana. *Oxford Economic Papers*, *24*(2), 212–240.

Sumner, A. (2018). *Development and Distribution: Structural Change in South East Asia*. Oxford University Press.

Thoburn, J. (2009). *Vietnam as a Role Model for Development* (Research Paper 2009/30; pp. 1–18). UNU World Institute for Development Economics Research (UNU-WIDER).

Todaro, M. P., & Smith, S. C. (2014). *Economic Development, 12th edition* (12 edition). Trans-Atlantic Publications.

Wade, R. (2003). *Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization*. https://press.princeton.edu/books/paperback/9780691117294/governing-the-market

Wang, X., & Weaver, N. (2013). Surplus labour and Lewis turning points in China. *Journal of Chinese Economic and Business Studies*, *11*(1), 1–12. https://doi.org/10.1080/14765284.2012.755303

World Bank. (2014). *Africa's Pulse: Decades of Sustained Growth is Transforming Africa's Economies.* World Bank. http://www.worldbank.org/en/region/afr/publication/africas-pulsedecades-of-sustained-growth-is-transforming-africas-economies

World Bank. (2016). *Getting Back on Track: Reviving Growth and Securing Property fo All (Thailand Systematic Country Diagnostic)*. https://documents1.worldbank.org/curated/en/855161479736248522/pdf/110

396-REVISED-v1-4-26-WB-TH-SCD-REPORT-BOOKLET-159PAGE-RevisedApr26.pdf

World Bank. (2020, June 20). *World Development Indicators | DataBank*. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators

Xu, Y. (1994). Trade liberalization in China: A CGE model with Lewis' rural surplus labor. *China Economic Review*, *5*(2), 205–219. https://doi.org/10.1016/1043-951X(94)90024-8

Yao, S. (2000). How Important is Agriculture in China's Economic Growth? *Oxford Development Studies*, *28*(1), 33–49. https://doi.org/10.1080/713688306

Chapter 4
The nature of the labour market in Ghana and Nigeria

Abstract:

This section investigates the nature of the labour market in Ghana and Nigeria. It uses two waves of the Ghana Living Standard Survey (GLSS) and Nigeria's General Household Survey (GHS) to analyse the country-specific characteristics in skill requirements, the type of job employed within the sub-sector and wage levels. The study finds that most employment occurs in trade and other commerce, mixed farming, and crop production sub-sectors. While most workers in trading and other commerce sub-sectors have up to mid-level (JHS and SHS) formal education, most of the labour force in crop production and mixed farming have up to primary education level. Although growth in private wage jobs occurred, self-employed/non-wage employment is dominant in the labour markets. Real wage levels of sub-sectors in agriculture are low and decreasing, indicating a potential for labour migration from the sector. However, the relatively low and declining real wage level of the trade and commerce subsector is a matter of concern, especially for the African youth.

Keywords: Labour, employment, education, wage, Ghana, Nigeria

4.1 Introduction

Structural transformation resulting from the reallocation of labour from less productive sectors of the economy to more productive ones goes with the economic development process (Barrett et al., 2001; Duarte & Restuccia, 2010). This causes a shift in sectoral employment shares -a part of the changing structure of economies during economic growth and development. The theoretical basis for this argument and evidence of it

has been brought up in development economics research (e.g. Lewis, 1954; Wang & Weaver, 2013).

The theory assumes an unlimited labour supply and supposes that the traditional/agriculture sector's labour, characterised by low marginal labour productivity, migrates to the modern capitalist industrial sector as the economy progresses with time. In Africa, while economic growth is accompanied by a decline in the shared employment in agriculture (Diao et al., 2017; McMillan et al., 2014; Osei & Jedwab, 2016), a substantial increase in employment share in the industrial sector has not occurred. In actuality, the declining employment in agriculture in most African countries has been accompanied not only by a proliferation of small –and medium-scale enterprises in manufacturing, transportation, and construction but more so, by a wide range and greater share of employment in services (McMillan et al., 2014).

At the same time, the sub-Saharan African region has consistently recorded an increasing population growth rate of about 3 percent per annum for the past five decades (1968-2018). In Ghana and Nigeria, for instance, the workforce population has been growing at a rate of about 2 percent per annum (World Bank, 2020). This growth in the workforce is fed to a large extent by rural populations who display higher fertility rates than their urban counterparts and thus produce a growing surplus of working-age youths (Lesthaeghe, 2014). The expanding workforce poses opportunities and challenges to the labour market and economic growth. With the right investment incentives and available opportunities for viable employment, the economies may experience rapid transformation and income growth. The expanding workforce creates a labour pool for thriving sectors in the economies needed for a structural transformation process.

On the other hand, if new job opportunities in the nonfarm sectors are limited, this could lead to lower living standards, disenchantment, and general social instability (Yeboah & Jayne, 2018). These challenges are visible in most African economies, including the high economic performers. The creation of insufficient formal wage jobs to engage the growing workforce has been the bane (Filmer & Fox, 2014; Fine et al., 2012; Page & Shimeles, 2015). The consequences have been jobless economic growth, and vulnerable jobs dominated by self-employment and unpaid family labour are common among Africa's growing economies (International Labour Organization, 2014; Osei-Boateng & Ampratwum, 2011; Page & Shimeles, 2015; Sackey & Osei, 2006).

Studies on structural transformation processes in an economy usually focus on changes in the contribution of the economic sectors. Specific studies on the farm and non-farm sectors are usually concerned with rural household income or welfare (e.g. Babatunde, 2009; de Janvry & Sadoulet, 2011; Senadza, 2012), while the nature of the economic sectors is least focused. This study seeks to identify major employing sub-sectors of the economic sectors, human resource endowment (skill level), type of jobs created, and wage levels. An exercise like this enables a better placement and understanding of the labour market from the perspective of development theory. This study is in four folds: first is an exploration of the extent of sub-sectoral employment provision in the economic sectors of Ghana and Nigeria. Second is the identification of the skill requirements in the sub-sectors. Following this is an examination of the changing trend of job creation. The last task is an examination of the wage levels within the sub-sectors.

The organisation of the remaining sections are as follows: the background of the study detailing the context of this study (section 4.2). Sections 4.3 describe the data and methods used. Section 4.4 follows with a discussion of the results. Lastly, section 4.5 summarises and concludes key findings and their implications for the nature of the expanding non-farm sector.

4.2 **Background**

The dual-sector economic growth theory is relevant in explaining why in the development process, the agricultural sector's contribution to the economy declines as the nonfarm sector increases (J. R. Harris & Todaro, 1970; Lewis, 1954; Ranis & Fei, 1961). The theory emphasises the existence of a traditional/agricultural and a modern/industrialised sector. It identifies wage differentials and productivity growth as the main drivers that initiate labour migration from the agriculture sector to the modern-industrial sector.

To reiterate, the model assumes low marginal productivity in the agricultural sector. The implication is that declining land availability makes additional household members less labour productive. On the other hand, a relatively higher marginal productivity in the industrial sector results in higher wages which stimulates migration of household "surplus labour" from the agriculture sector (J. R. Harris & Todaro, 1970; Islam & Yokota, 2008; Lewis, 1954; Ranis & Fei, 1961). Per the model, the agricultural sector's contribution to income and employment will decrease relative to the non-agricultural sector in the economies of developing countries such as Ghana and Nigeria (Enache et al., 2016; Osei & Jedwab, 2016; Oyelaran-Oyeyinka & Ola-

David, 2017; Sparreboom & Gomis, 2015). In addition are an increasing urban population and a dwindling rural population in economies (World Bank, 2020).

Already, the original theory pitched the manufacturing sub-sector as the first point of employment before the services and other nonfarm sectors (Lewis, 1954). At the initial influx, migrants from the agricultural sector are usually less trained and qualified for jobs in the nonfarm sector. Thus, full engagement of household "surplus labour" from the farm sector is not likely to happen due to the reliance on skilled labour in the modern manufacturing sector (Osei & Jedwab, 2016). Instead, the migrant labour finds employment in general activities such as packing and sorting manufactured items. Those unable to find a place in the limited industrial sector flood the services and other nonfarm sectors where the barriers to entry are relatively lower. Such alternatives in developing economies usually have sub-sectors with a sizeable share in employment and are dominated by a low-skilled and often self-employed workforce. This study will present the current nature of the labour market in Ghana and Nigeria. We compare, where possible, the two countries for similarities or differences.

4.3 Sources of data and methods

The analyses rely on two waves of nationally representative household survey data. In Ghana, the data is from the fifth, sixth and seventh waves of the Ghana Living Standard Survey -GLSS5(2005/06), GLSS6(2012/13), and GLSS7(2016/17). For Nigeria, the data is from the first, second and third waves of the General Household Survey (GHS) -GHS1(2010/11), GHS 2 (2012/13) and 3 (2015/16). To account for sampling weights, clusters and stratification of the survey, the STATA survey "svy" command is used to ensure the right outputs of point estimates and standard errors (StataCorp., 2021).

The sample unit of our data analysis includes all working individuals in the economy between the ages of 15 and above. The stated employment by the respondents for their main economic activity was classified/categorized based on the international standard for industrial classification (ISIC) codes (United Nations, 2008). Descriptive statistical tables and charts illustrates the results from the analysis.

Agro-processing is separated from the manufacturing sector because of its close relation to the food system and is usually considered a nonfarm enterprise. The agro-processing sector entails food product processing and beverage manufacturing (Diao et al., 2018; Lambon-Quayefio, 2017). The services sub-sector ranged from wholesale, retail and trade activities to other formal and informal off-farm employment that does not fall into industrial or agro-processing-based activities. All economic activities

concerning mining and quarrying, manufacturing, construction, and electricity/water/waste (utilities) constitute the industrial sector. Crop production, animal husbandry, forestry, aquaculture and allied services are employing subsectors in the agriculture sector. These classifications allow us to identify the dominant employing sub-sectors within the economic sectors.

The categorical formal education level attained/completed represents a proxy for average skill requirements for the employing sub-sectors. Education level at; Primary[1], Junior Secondary/Junior High School (JHS)[2], Senior Secondary/Senior High School (SHS)/Middle school[3], and Diploma-Tertiary[4] are the four categories of education level used for the skill requirements. The sub-sector and categorical education level use cross-session tabulation for analysis.

Two main categories of job types identify the types of employment created within the sub-sectors -wage and self-employed/non-wage employed. Wage employment includes economic activities undertaken by a person for a public or private employer with the expectation of remuneration in wages/salaries or in-kind as stipulated in a formal or informal agreement between two or more agents. Wage employment includes public and private wage employment. The Self-employed /non-wage is economic activities undertaken by own-account workers who could be entrepreneurs without employees, employers, and paid family workers.

This chapter seeks to answer the following questions: 1) what is the distribution of employment in the sub-sectors in the economies of Ghana and Nigeria, 2) what type of employment is in the sub-sectors, and 3) what are the real wages in the sub-sectors?

4.4 Economic structure in the labour markets

The declining agricultural share in income and employment and the subsequent relative growth of the non-agricultural sector has been the motivation to understand the nature of their sub-sectors. We explore employment shares in the sectors and sub-sectors, the average skill levels required, and employment types. Although agriculture

[1] Primary education level is a six-year standard formal education usually given to children from the minimum age of 5 years.

[2] Junior secondary/high school is three years duration of study after completion of primary education.

[3] Senior Secondary/High School/Middle school is a post-junior secondary education. The duration ranges from three to four years.

[4] Diploma-Tertiary is a post-secondary level of education. A diploma level of education usually takes two years to complete. The tertiary level includes undergraduate (4 years), graduate (2 years and above) and postgraduate (duration depending on course structure).

provides a significant number of the employed, nonfarm sub-sectors requiring relatively low skill and with low barriers to entry will be dominant employers in the labour market. Therefore, the major sub-sector employers are tipped to be dominated by informal main economic activity.

The neoliberal economic policy reforms in Ghana and Nigeria have decreased the relative size of the largest formal employer (the government) in recent decades as part of a policy to downsize its wage bill (Aryeetey et al., 2019). The informal economy becomes the alternative to accommodate job seekers. In part due to rapid population growth and labour force outpacing job growth in the formal sector (Fine et al., 2012; Otoo, 2019). The discussion so far is further elaborated in the following sub-sections.

4.4.1 **Sub-sector employment**

This sub-section explores the economic sub-sectors contribution to employment in the labour market of Ghana and Nigeria. Employment shares are presented for sub-sectors in the overall economy and within sectors (see Table 4.1a and b for Ghana and Nigeria). In the economies of Ghana and Nigeria, the three most relevant sub-sectors where most people are employed are; trading activities (wholesale, retail and other commerce), mixed farming[5] and crop production. In Ghana, labour in crop production, followed by mixed farming, decreased marginally as those in trade increased after an initial increase over the three survey periods. On the other hand, in Nigeria, labour employed in trading activities and, mixed farming marginally decreased after it increased initially from the first survey (GHS1). The share of the labour force in food production increased throughout the survey periods.

The result shows three sub-sectoral dominance in both countries. These three identified sub-sectors are highly informal and prevail in the description of the labour market of the two countries (e.g. Diao & Hazell, 2019; Otoo, 2019). Also, both tables suggest that the trade sub-sector is likely to be the destination of most agricultural migrant labour in both countries since it is the largest non-farm sub-sector of employment. The trade sub-sector ranges from activities related to domestic petty trading to international trading undertaken by professionals within the country. Overall, a larger share of workers can be found in the agriculture sector (not less than 40%), followed by the services (not less than 36%), industry (not less than 8%), and agro-processing (not less than 3%) in the respective order. While the share of workers in the agricultural sector

[5] Mixed farming comprises a pair or more combinations of crop production, livestock keeping, sericulture/beekeeping or other integrated forest production, and other likes of farming.

of the labour market has been marginally decreasing, the labour share in the services, industry and agro-processing sectors showed an increasing trend. The reduction in labour employed in agriculture and subsequent increase in non-farm employment is expected in economic development and in a wider sense, the structural transformation process.

Table 4.1a: Employment share of sectors and sub-sectors in the labour market, Ghana (%)

	Ghana		
	GLSS5	**GLSS6**	**GLSS7**
Services	**28.66**	**36.80**	**39.40**
Wholesale, retail and other commerce	16.59	20.81	21.94
Accommodation and restaurant	1.89	3.77	3.02
Transportation, storage and communication	2.88	3.58	3.44
Financial, insurance and real estate	0.39	0.66	1.05
Professional, scientific and technical activities	0.92	0.87	0.52
Public administration, defence, and support services	1.29	1.51	2.02
Education	2.84	3.14	4.28
Human health and social work activities	0.80	0.90	1.21
Other services	1.06	1.60	1.96
Industry	**7.82**	**9.60**	**11.20**
Mining and quarrying	0.68	1.36	1.51
Manufacturing	5.05	5.13	5.46
Electricity/water/gas/waste	0.25	0.34	0.31
Construction	1.84	2.78	3.95
Agro-processing	**5.62**	**3.40**	**6.30**
Food products	4.80	3.00	6.30
Alcoholic and non-alcoholic drinkables	0.82	0.40	2.09
Agriculture	**57.89**	**50.20**	**43.10**
Crop production	54.96	24.74	18.67
Livestock	0.30	0.29	0.32
Mixed farming	0.86	23.87	22.64
Forestry and logging	0.44	0.31	0.62
Aquaculture and fisheries	1.33	0.95	0.81
Total	**100**	**100**	**100**

Source: Estimates from GLSS5(2005/06), GLSS 6 (2012/13), and GLSS7 (2016/17)

Table 4.1b: Employment share of sectors and sub-sectors in the labour market, Nigeria(%)

	Nigeria		
	GHS1	**GHS2**	**GHS3**
Services	**41.88**	**40.50**	**42.50**
Wholesale, retail and other commerce	22.49	22.70	21.81
Accommodation and restaurant	1.60	1.31	1.43
Transportation, storage and communication	3.44	4.21	3.65
Financial, insurance and real estate	0.24	0.29	0.30
Professional, scientific and technical activities	2.30	2.01	2.76
Public administration, defence, and support services	1.86	1.94	2.85
Education	2.96	2.89	4.10
Human health and social work activities	1.75	1.23	1.62
Other services	5.24	3.91	3.95
Industry	**8.44**	**9.60**	**9.80**
Mining and quarrying	0.32	0.38	0.33
Manufacturing	4.86	5.58	5.45
Electricity/water/gas/waste	0.44	0.59	0.49
Construction	2.82	3.02	3.49
Agro-processing	**2.95**	**3.80**	**3.90**
Food products	2.83	3.70	3.80
Alcoholic and non-alcoholic drinkables	0.12	0.06	0.06
Agriculture	**46.73**	**46.20**	**43.90**
Crop production	11.48	13.66	15.80
Livestock	3.52	3.32	3.44
Mixed farming	20.99	24.87	21.18
Forestry and logging	1.74	0.26	0.47
Aquaculture and fisheries	9.00	4.06	3.01
Total	**100**	**100**	**100**

Source: Estimates from GHS1(2010/11), GHS 2 (2012/13) and GHS 3 (2015/16)

Expectedly, trading activities are the most important economic activity within the services sector in Ghana and Nigeria (Table 4.2). Trading activities serve as the primary activity for over 50 percent of the workforce in the services sector in both countries. The share of employment provided by trading activities is disproportionately large than other services sub-sectors combined. This could reflect

the ease of entry and the capacity of the wholesale, retail and other commerce to accommodate a larger workforce size. The transportation and education sub-sectors also play a significant role in employment creation in both countries.

In the industrial sector, the manufacturing sub-sector, followed by the construction sub-sector, employed most of the workforce in both countries. In Ghana, manufacturing share to employment in the industrial sector showed a declining trend over the three survey periods. On the other hand, manufacturing share to employment in the industrial sector in Nigeria declined after an initial increase. The components of the manufacturing sub-sector are presented in appendix 1 and show that small-medium scale enterprises dominate the sectors as identified by McMillan et al., (2014) for most African countries. Informal manufacturing activities account for at least 90 percent of employment in the manufacturing sub-sector of Ghana (Osei & Jedwab, 2016). The construction shares in the industrial sector labour increased throughout the survey periods of Ghana. In Nigeria, construction share increased after an initial decrease from the previous survey (GHS2). The increasing trend in the size of labour in the construction subsector is in line with the infrastructural needs of both countries to drive development.

In both countries, the food processing sub-sector of the agro-processing sector provided most of the jobs. The significance of food processing is relevant for primary agricultural production due to its value addition to raw materials. Traditional food processing for household consumption and storage has a spill-over effect. Because in the industrialisation and agriculture commercialisation promotions, food processing is in the middle to convert primary commodities to secondary or tertiary products for consumption and improved revenue.

The agriculture sector in Ghana and Nigeria is majorly at the subsistence small-scale production levels and rural-based. Farmers target supplying the local market, with little scale efficiency to support exports. Rural farm households usually diversify their production by keeping livestock or planting other crops in addition to the main crop as a buffer against risk (Chauvin et al., 2012; Dorsey, 1999; Oyelaran-Oyeyinka & Ola-David, 2017). As such, mixed farming appeared to be one of the most relevant sub-sectors in the agricultural sector. Mixed-farming contribution to employment in the agriculture sector has been increasing in Ghana during the three survey periods. In Nigeria, mixed-farming production decreased after an initial increase from the previous survey (GHS2). The second relevant sub-sector after mixed farming in both Ghana and Nigeria in recent surveys is crop production. However, the share of labour in crop production in Ghana has been decreasing in Ghana. In Nigeria, the labour force

in crop production has been increasing in the three survey intervals. Peculiar to Nigeria's agricultural labour force is the relatively large workforce in livestock rearing and aquaculture/fisheries. Nigeria has a larger population of nomadic and semi-nomadic tribes (e.g., the Fulani people) who are traditional livestock keepers. The country's specific geography, landmass, and the potential for the demand for fish products from its large population could account for this observation. For instance, Nigeria produced 296,191 metric tonnes of aquaculture products, and Ghana produced 57,415 metric tonnes in 2017 (World Bank, 2020).

In the discussion so far, it is seen that industrial sub-sectors are less prominent in areas concerning job creation. This is different from the original ideas of Lewis (1957) that expected relevance of the industrial sector even at the stage of development in Ghana and Nigeria. Suffice it to mention the economic development pursued in the industrialisation process of Ghana and Nigeria post-independence with much focus on manufacturing before oil production in Nigeria, and the economic downturn in the late 1960s mirrored Lewis's ideas. A notable feature of industrialisation was that not only were they state-funded, but they were also capital-intensive, which ignored the fact that the initial advantage of most developing economies lies in labour-intensive activities. The sector was therefore highly susceptible to macroeconomic and governance challenges because the import content of production regarding equipment and some raw materials was excessive. The industrial sector that emerged thus became costly as it consumed more resources than it created (Rapley, 2007). Most factories became unsustainable in the long run. In effect, the urbanisation surge that has been occurring since then in both countries produced no or little industrialisation, creating cities with sprawling urban employment in trading services and other informal sectors (Gollin et al., 2016).

Table 4.2 Within economic sector employment, Ghana and Nigeria(%)

	Ghana			Nigeria		
Services	**GLSS5**	**GLSS6**	**GLSS7**	**GHS1**	**GHS2**	**GHS3**
Wholesale, retail and other commerce	57.88	56.49	55.64	53.70	56.07	51.33
Accommodation and restaurant	6.58	10.22	7.65	3.82	3.23	3.38
Transportation, storage and communication	10.04	9.71	8.73	8.22	10.40	8.60
Financial, insurance and real estate	1.37	1.80	2.67	0.57	0.72	0.70
Professional, scientific and technical activities	3.22	2.36	1.32	5.49	4.96	6.50
Public administration, defence, and support services	4.51	4.11	5.12	4.44	4.79	6.70
Education	9.92	8.52	10.86	7.07	7.14	9.66
Human health and social work activities	2.78	2.44	3.06	4.17	3.04	3.82
Other services	3.71	4.35	4.97	12.51	9.64	9.30
Sub-sector Total	**100**	**100**	**100**	**100**	**100**	**100**
Industry						
Mining and quarrying	8.73	14.11	13.47	3.60	4.00	3.34
Manufacturing	64.59	53.44	48.62	57.69	58.24	55.88
Electricity/water/gas/waste	3.18	3.53	2.77	5.25	6.21	5.01
Construction	23.49	28.92	35.15	33.45	31.55	35.77
Sub-sector Total	**100**	**100**	**100**	**100**	**100**	**100**

Table 4.2: Continues

Agro-processing						
Food products	85.44	88.25	87.5	95.96	98.31	98.58
Alcoholic and non-alcoholic drinkables	14.56	11.75	12.50	4.04	1.69	1.42
Sub-sector Total	**100**	**100**	**100**	**100**	**100**	**100**
Agriculture						
Crop production	94.93	49.32	43.35	24.56	29.58	35.99
Livestock	0.52	0.58	0.73	7.54	7.20	7.83
Mixed farming	1.49	47.6	52.59	44.92	53.87	48.24
Forestry and logging	0.76	0.61	1.44	3.73	0.56	1.07
Aquaculture and fisheries	2.30	1.89	1.88	19.25	8.79	6.87
Sub-sector Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Estimates from GLSS5 (2005/06), GLSS 6 (2012/13), and 7 (2016/17) and GHS1 (2010/11), GHS 2 (2012/13) and 3 (2015/16)

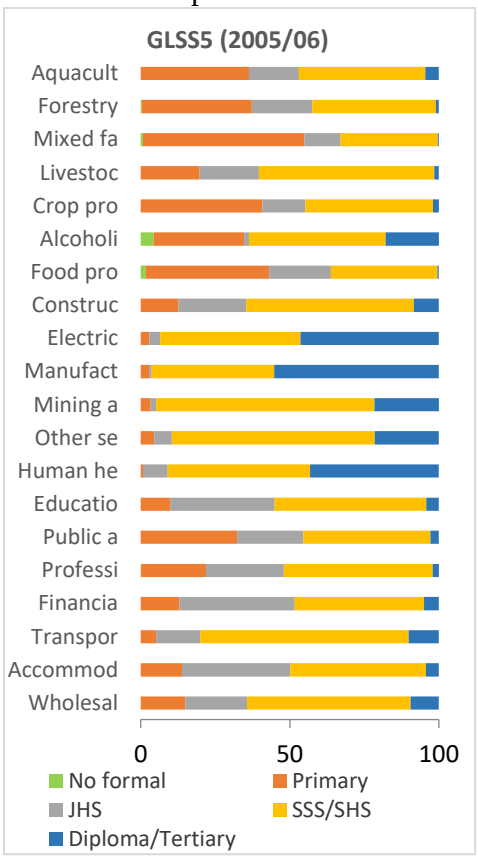
4.4.2 **Skill level in the labour market**

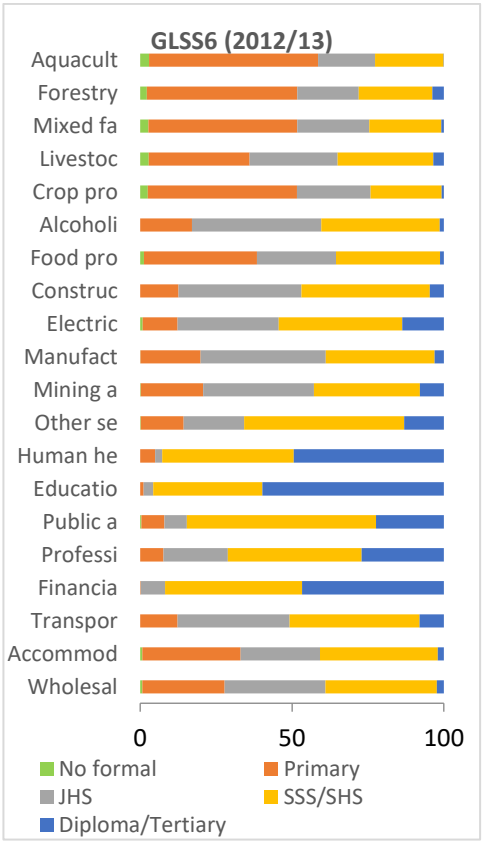
The education level of the labour force is used as a proxy to indicate skill levels in the sub-sectors of employment. Sub-sectors that are highly formal require labour with a higher education level. Undeniably, even if all the labour force attains a higher education level, not all will be employed by the government or the formal set-up. In the case of Ghana and Nigeria, where the literacy rate is relatively high (79% and 62%) (World Bank, 2020) and limited formal employment, informal employment becomes the available alternative (World Bank, 2010; World Bank Group, 2015). In Ghana, most young people enter the labour market without the necessary hands-on technical skills or qualifications. They enter the labour market after Junior and Senior High School (ISSER, 2010).

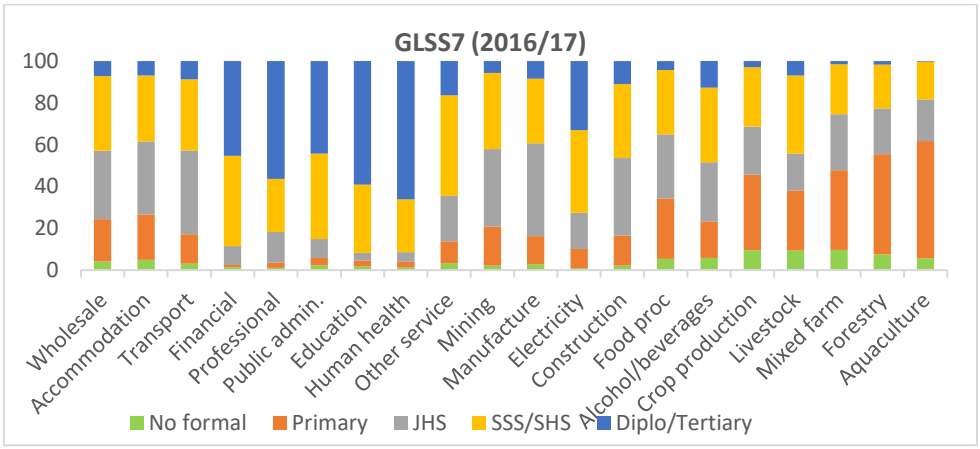
The education level of the labour force in the sub-sectors indicates that the higher tier of education level (diploma and tertiary) dominates the services labour force in finance, education, human health, professional/scientific activities, and public administration in both countries (Figures 4.1a and b). The skill-set of these subsectors' work is mostly technical and will require a labour force of such higher education level. However, a sizeable proportion of the secondary school-level educated labour force is in these sub-sectors. In the industrial sector of both countries, only the electricity sub-sector showed an appreciable concentration of labour force with such a higher education level. The trade, crop production, and mixed farming sub-sectors that dominate employment provision for both countries have most of their labour force in the lower (primary and JHS) tier of education level.

One observable delineating characteristic of Ghana and Nigeria is that the latter has a relatively higher proportion of the labour force with no formal education, especially in the food processing sub-sector of the agro-processing sector and in the livestock keeping and crop production in the agriculture sector. Nevertheless, the results from both countries have shown the heterogeneous nature of the required skill set employed for vacant positions in the sub-sectors. A minimum level of formal education offers a step into all the sub-sectors.

Figure 4.1a: Completed education level of the labour force in sub-sectors (Ghana), in percent.

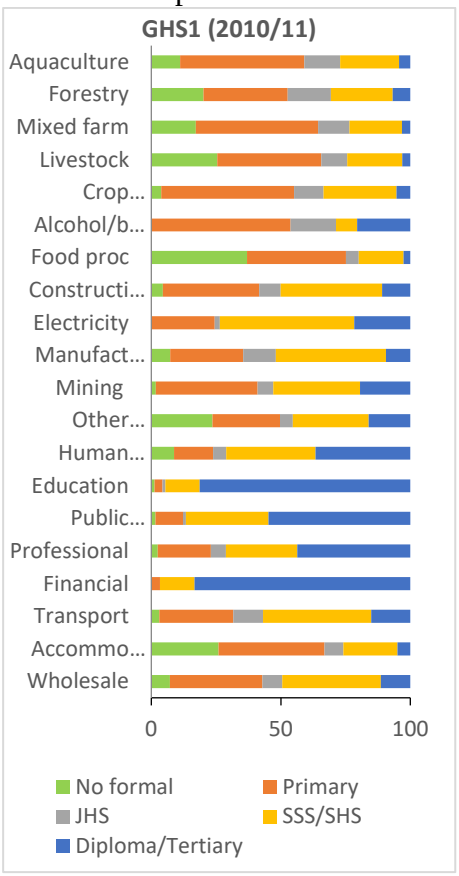


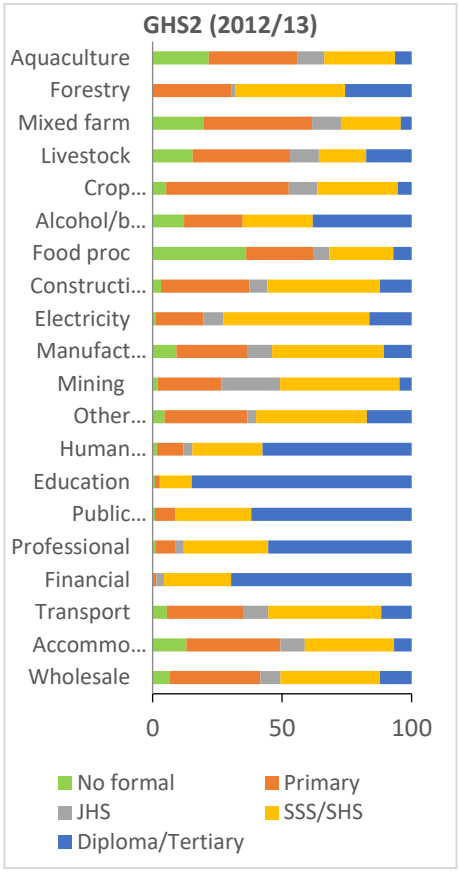


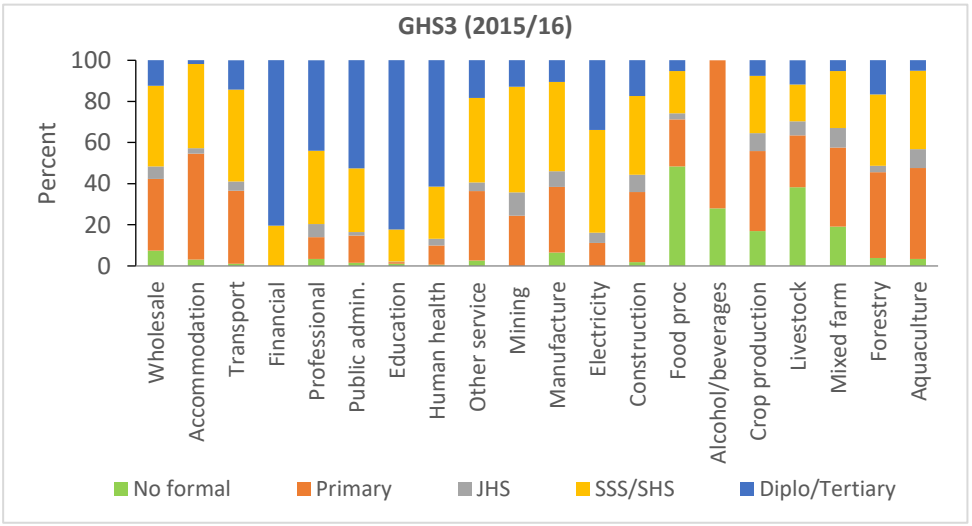


Source: Estimates from GLSS 5,6and 7 (2005/06, , 2012/13, 2016/17)

Figure 4.1b: Completed education level of the labour force in sub-sectors (Nigeria), in percent.







Source: Estimates from GHS1,2 and 7 (2010/11, 2012/13, 2016/17)

4.4.3 **Employment types in the labour market**

The main challenge in many developing countries is the lack of jobs that generate adequate income (Fields, 2015) as poverty among the working class, especially in urban centres, and underemployment has been visible characteristics. Labour migration to the nonfarm sector raises attention to the type of economic activity or jobs available or created. Previous studies hypothesise that, as countries transform their economies, the importance of self-employment/non-wage in the labour market declines over time as wage employment increases (La Porta & Shleifer, 2014; Yamada, 1996). Increased registration of firms during the development process, combined with an increase in the availability of wage/salary employment, make wage jobs a dominant livelihood choice (La Porta & Shleifer, 2014). In this sub-section, we examine the type of jobs in the key sub-sectors identified. The dominance of public/ private wage employment in the modernised/ industrial sector is likely to be the main feature here.

In Ghana, self-employed /non-wage jobs are the prevailing type of jobs created in the trading and accommodation sub-sectors of the services sector (Table 4.3a). More than 50 percent of the labour force in these sub-sectors are self-employed. A similar observation is in the Nigerian labour market (Table 4.3b). However, a preeminent proportion (more than 70% in the sub-sectors) are self-employed/non-wage labour. Although the self-employed labour force is quite common in the transportation sub-sector in both countries, private wage jobs also have a significant share. Expectedly, public wage jobs are prevalent in public administration, education and human health sub-sectors. These sub-sectors support service sectors of the government and have persisted in pre-and-post reforms.

An observation of the results of the industrial sector in Ghana is that private wage job is the dominant job type for all its sub-sectors except manufacturing which has a larger share of self-employed/non-wage employment, and electricity, whose labour fluctuates between public and private wage employment over the survey periods. This confirms that informality persists in the manufacturing sub-sector(McMillan et al., 2014). The electricity sub-sectors appreciable proportion of public wage jobs stems from its relevance as an energy source for economic development activities. This perhaps makes most governments reluctant to relinquish total control of the sector to private operators. In Nigeria, a self-employed/non-wage job is the dominant employment type for the mining and manufacturing sub-sectors of the industrial sector. The electricity and the construction sector have an appreciable size of wage jobs similar to the Ghanaian labour market.

Self-employed/non-wage employment is dominant in the food product processing and beverage manufacturing sub-sectors of the food processing sub-sector in both countries. In recent times, while Ghana has had an appreciable proportion of private wage jobs in the alcohol and beverage sub-sector, the self-employed/non-wage still dominate the sub-sector. The results indicate growth in privately owned formal agro-processing companies in Ghana. Among the giants are Kasapreko Company Ltd., and Nkulenu Industries Ltd., whose products are already in the international markets.

In Ghana and Nigeria, agricultural sector employment is majorly self-employed/non-wage in all sub-sectors. A significant proportion of wage employment is in the forestry and logging subsector due to government institutions that oversee the sub-sector.

Apart from this, is a substantial increase in private wage jobs in the sub-sectors for both countries. Productivity growth in the sub-sectors increases wage jobs and facilitates structural transformation (Diao et al., 2017). It does not, however, suggest that a new labour force in the labour market will find formal wage jobs easily due to limited vacancies (Page & Shimeles, 2015).

Table 4.3a: Employment types within economic sub-sectors in Ghana (%)

	GLSS5 (2005/06)			GLSS6 (2012/13)			GLSS7 (2016/17)		
Services	**a**	**b**	**c**	**a**	**b**	**c**	**a**	**b**	**c**
Wholesale, retail and other commerce	0.39	16.28	83.33	0.58	17.22	82.20	0.51	33.38	66.11
Accommodation and restaurant	0.87	21.64	77.49	1.41	19.03	79.56	1	44.71	54.29
Transportation, storage and communication	10.83	72.11	17.06	9.98	69.31	20.70	3.06	75.03	21.91
Financial, insurance and real estate	34.71	52.56	12.73	18.05	73.54	8.41	6.43	82.32	11.25
Professional, scientific and technical activities	22.81	54.03	23.16	19.08	43.78	37.13	21.34	44.99	33.67
Public administration, defence, and support services	93.35	6.65	0.00	54.67	41.04	4.30	70.42	26	3.58
Education	70.22	27.44	2.34	65.96	27.72	6.32	59.32	39.21	1.48
Human health and social work activities	63.34	19.15	17.51	68.95	16.91	14.14	73.62	22.42	3.96
Other services	23.97	30.90	45.12	9.92	59.55	30.53	11.74	69.12	19.14
Industry									
Mining and quarrying	12.06	64.43	23.51	3.00	83.19	13.82	3.34	86.7	9.95
Manufacturing	2.90	36.39	60.71	0.91	33.31	65.79	1.03	46.73	52.24
Electricity/water/gas/waste	56.76	20.52	22.72	31.12	54.36	14.51	65.79	32.21	2
Construction	3.13	58.84	38.04	3.20	57.98	38.82	1.2	72.45	26.35
Agro-processing									
Food products	0.48	10.83	88.69	0.73	17.30	81.98	0.79	35.05	64.16
Alcoholic and non-alcoholic drinkables	1.53	19.56	78.92	0.64	38.41	60.94	0	53.48	46.52
Agriculture									
Crop production	0.16	1.64	98.20	0.37	1.89	97.74	0.69	45.75	53.56
Livestock	0.00	12.73	87.27	1.04	30.45	68.51	0.86	66.47	32.67
Mixed farming	10.22	40.54	49.24	0.02	0.69	99.28	0.084	47.17	52.75
Forestry and logging	15.42	37.04	47.54	8.38	22.51	69.11	2.12	50.1	47.78
Aquaculture and fisheries	0.17	14.80	85.03	0.46	18.68	80.86	0	61.52	38.48

**a=Wage-public, b=Wage-private, c=Self -employed /non-wage*

Source: Estimates from GLSS 5, 6 and 7 (GSS, 2005/06, 2012/13, 2016/17)

Table 4.3b: Employment types within economic sub-sectors in Nigeria(%)

	GHS1 (2010/11)			GHS2 (2012/13)			GHS3 (2015/16)		
Services	**a**	**b**	**c**	**a**	**b**	**c**	**a**	**b**	**c**
Wholesale, retail and other commerce	3.58	14.87	81.55	3.68	7.45	88.88	1.90	20.37	77.73
Accommodation and restaurant	7.09	21.31	71.60	9.35	9.20	81.45	3.71	21.75	74.54
Transportation, storage and communication	33.06	9.93	57.00	26.13	4.73	69.14	14.77	43.79	41.45
Financial, insurance and real estate	31.82	66.48	1.71	38.82	54.39	6.79	39.97	60.03	0.00
Professional, scientific and technical activities	45.45	8.83	45.71	28.33	48.77	22.90	20.42	71.16	8.42
Public administration, defence, and support services	92.78	4.41	2.80	92.88	4.64	2.48	73.14	25.49	1.36
Education	90.48	4.70	4.82	57.75	42.25	0.00	44.56	55.44	0.00
Human health and social work activities	55.27	11.11	33.62	73.65	6.85	19.50	58.33	27.15	14.52
Other services	23.97	30.90	45.12	40.38	6.53	53.09	25.20	37.97	36.82
Industry									
Mining and quarrying	37.43	12.97	49.60	7.98	9.29	82.73	6.16	43.58	50.26
Manufacturing	10.09	13.90	76.01	7.35	7.42	85.23	4.83	29.71	65.46
Electricity/water/gas/waste	49.43	24.23	26.34	57.33	20.81	21.85	46.55	37.84	15.62
Construction	12.78	67.40	19.82	11.81	69.51	18.68	5.58	80.64	13.78
Agro-processing									
Food products	3.23	11.83	84.93	4.08	6.05	89.87	0.26	20.04	79.70
Alcoholic and non-alcoholic drinkables	0.00	18.01	81.99	10.55	26.86	62.59	0.00	0.00	100.00
Agriculture									
Crop production	1.74	17.52	80.73	1.75	11.01	87.25	1.63	11.07	87.30
Livestock	0.88	28.30	70.82	0.80	7.45	91.75	1.54	12.51	85.95
Mixed farming	0.84	22.04	77.12	0.29	12.57	87.13	0.53	6.43	93.04
Forestry and logging	6.20	22.91	70.88	29.65	6.80	63.55	21.15	2.79	76.06
Aquaculture and fisheries	1.78	24.13	74.08	4.29	6.23	89.48	1.41	7.59	91.00

**a=Wage-public, b=Wage-private, c=Self -employed /non-wage*

Source: Estimates from GH1(2010/11), GHS 2 (2012/13) and 3 (2015/16)

4.4.4 **Wage levels in the labour market**

The dual development theory propounded by Lewis, (1954), anticipates wage rate at the level of subsistent agriculture, providing the industrial sector with an available labour supply. While rural/agricultural wages often remain averagely low, urban/industrial wages are high. This segmentation partly induces higher productivity in the non-farm sector; due to increased morale and a better standard of living (Rapley, 2007). Given this and the perception of better wages in the cities, more job seekers are attracted to the modern/industrial sector than there are available vacancies. The consequence is the swell in the urban workforce population and the incidence of un/under-employment, and that is a matter of concern. A few of "the lucky" labour can find employment in the formal sector of the economy. Sub-sectors in the formal sector mostly adhere to minimum wage requirements in line with the international labour organisation (ILO) advocacy. In Ghana, the gross monthly minimum wage as of 2013 was 72.4 United States dollars. Nigeria has a gross monthly minimum wage of 114 United States dollars as of 2013 (ILOSTAT, 2018).

Differences in real wage levels between sub-sectors are assumed to trigger intersectoral labour movements from lower to higher wage levels (e.g. see J. Harris & Todaro, 1970). The sub-section uses the consumer price index at constant 2019 prices to estimate the real wage levels. The average wage levels of all sub-sectors in the labour market of Ghana and Nigeria are in Tables 4.4a and b.

Daily real wages in the agriculture sector in both countries are relatively low and decreasing for most of the employing sub-sectors –crop production and mixed farming. Both countries recorded a negative growth rate over the survey period. At the current wage level, "surplus" agricultural labour will likely migrate to the nonfarm sector(s) due to a decline in the growth rate of the real wage. The manufacturing, construction, and electricity sub-sectors will attract the migrating labour due to positive growth in the real wage. However, these sub-sectors may require specialised skills and besides, there is a limited capacity to employ a massive turnout of surplus labour in the short term. Other nonfarm subsectors with positive real wage growth, such as financial and real estate, professionals and scientists, education, and the health sub-sector of the services sector, are majorly formal or semi-formal. They also have capacity and skill barriers which prevent migrating labour entry.

The wholesale, retail and other commerce, the most populous sub-sector, showed a negative growth rate in real wages for both countries. The implication is that, although the sub-sector is swelling with the employed labour force, real incomes and

productivity is at a dip. To reiterate, most migrating agricultural/rural labour in both countries face barriers to formal employment entry. Trading activities, therefore, become the best alternative. The sub-sector, especially in the informal subdivision, requires less starting capital (e.g., selling in the street of most African cities). The result has been a relatively large population of African youths surviving on petty trade.

Overall, the non-farm sub-sectors showed considerably higher wage levels in real terms. However, growth in real wages has occurred in sub-sectors that do not provide the majority of jobs. The wholesale and trade sub-sector showed a decline in the real wage level. This signals that migration into the urban/industrialised sector with the expectation of higher wages or better employment conditions could be a marriage for most labour.

Table 4.4a: Real wage levels in the economic sub-sectors in Ghana (Ghana Cedis)

Services	GLSS5 (2005/06)	GLSS6 (2012/13)	GLSS7 (2016/17)	Growth rate
Wholesale, retail and other commerce	8.64	9.38	7.58	-1.18
Accommodation and restaurants	6.81	8.77	5.21	-2.40
Transportation, storage and comm.	8.70	11.62	8.80	0.11
Financial, insurance and real estate	14.98	12.07	15.27	0.17
Professional, scientific and tech. act.	10.56	12.57	15.79	3.72
Public admin., defence, & support serv.	12.32	12.22	14.45	1.46
Education	11.35	13.74	11.75	0.31
Human health and social work activities	11.27	14.58	13.43	1.61
Industry				
Mining and quarrying	19.20	18.35	19.11	-0.05
Manufacturing	9.27	9.59	9.75	0.47
Electricity/water/gas	9.10	9.54	9.28	0.18
Construction	11.03	14.07	15.34	3.04
Agro-processing				
Food products	8.40	8.32	6.69	-2.05
Alcoholic and non-alcoholic drinkables	8.12	8.15	7.84	-0.32
Agriculture				
Crop production	8.64	9.13	7.04	-1.84
Livestock	7.65	7.43	6.25	-1.82
Mixed farming	7.43	10.37	6.20	-1.62
Forestry and logging	9.23	10.72	9.99	0.73
Aquaculture and fisheries	10.72	15.11	13.17	1.88

Real wage at const. 2010 CPI value; 2006_{CPI}=58.71, 2013_{CPI}=130.06, 2017_{CPI}=230.87(WDI, 2020)

Source: Estimates from GLSS 5, 6 and 7 (GSS,2005/06, 2012/13, 2016/17)

Table 4.4b: Real wage levels in the economic sub-sectors Nigeria (Naira)

Services	GHS1 (2010/11)	GHS2 (2012/13)	GHS3 (2015/16)	Growth rate (%)
Wholesale, retail and other commerce	473.55	439.29	450.24	-1.00
Accommodation and restaurants	702.87	745.25	798.88	2.59
Transportation, storage and comm.	844.01	793.97	666.79	-4.60
Financial, insurance and real estate	1188.38	1112.25	1275.59	1.43
Professional, scientific and tech. act.	1264.07	1254.84	1282.00	0.28
Public admin., defence, & support serv.	1086.04	1008.69	1044.17	-0.78
Education	1019.92	1021.95	1034.50	0.28
Human health and social work activities	985.35	1009.11	1014.57	0.59
Industry				
Mining and quarrying	1208.34	1174.64	1177.94	-0.51
Manufacturing	603.79	603.57	976.06	10.08
Electricity/water/gas	903.16	934.68	1154.25	5.03
Construction	961.08	883.27	962.55	0.03
Agro-processing				
Food products	356.82	319.49	347.70	-0.52
Alcoholic and non-alcoholic drinkables	181.24	118.78	NA	
Agriculture				
Crop production	379.56	373.52	356.30	-1.26
Livestock	318.76	353.11	345.55	1.63
Mixed farming	342.83	329.93	338.56	-0.25
Forestry and logging	324.45	424.23	477.86	8.05
Aquaculture and fisheries	411.29	415.84	432.07	0.99

Real wage at constant 2010CPI; 2011CPI=110.84,2013CPI=134.92,2016 CPI=183.85(WDI, 2020)

Source: Estimates from GHS 2 and 3 (BNS, 2012/13, 2015/16)

4.5 Summary and conclusion

The study analyses the nature of the labour market in Ghana and Nigeria in the given structural transformation. We focused on employment, skill levels, created job types, and wage levels feature over three-survey periods. We found that the most populous sub-sectors in both countries are trading and other commercial activities in the services sector, mixed farming, and crop production in agriculture. Although the manufacturing sub-sector provides most jobs in the industrial sector, its share in total employment in the labour market is small but not negligible as compared to other sub-sectors.

The leading sub-sector had all levels of formal education in their labour force ranks. While most labour force in trading and other commerce sub-sector have up to mid-level (JHS and SHS) formal education, the labour force in crop production and mixed farming have up to primary education level. It presupposes that farm labours that reach mid-level formal education are likely to be a sizeable stream of the workforce that exits the agriculture sector.

Although there is growth in private wage jobs, most created jobs in the dominant sub-sectors are self-employed/non-wage. Possibly it could be the result of an increased focus on promoting private-wage jobs and minimising the public sector wage burden as a policy focus for most African states' post-economic reforms (Aryeetey et al., 2014).

The wage levels in real terms of all leading sub-sectors in the agricultural sector decreased. It makes other sub-sectors offering higher and positive growth in real wage attractive to agricultural labour surplus. However, due to bottlenecks in the labour market, the trade and other commerce sub-sector employ the masses despite a decreasing and relatively low wage level in real terms.

In a nutshell, the nature of the labour markets in both countries are similar. In the short-medium term, self-employed trading activities will continue to be the most popular mode of employment for the youth after they terminate or pause their formal education at JHS or SHS. A consequence of the current wage level being relatively low in the dominant sub-sector and continuous migration of labour from the agricultural sector growth in the urban workforce population.

So far, the limitation of this study has been the relatively short interval of the survey periods and inadequate time series data which does not allow or permit a very bold statement of actual employment creation/generation in the sectors. Because short-term disturbance could influence the results as observed.

4.6 References

Aryeetey, E., Baah-Boateng, W., Ackah, C., G., Mbiti, I., & Lehrer, K. (2019). Country Studies. In H. Hino & G. Ranis (Eds.), *Youth and Employment in Sub-Saharan Africa: Working but Poor*. Routledge. https://www.routledge.com/Youth-and-Employment-in-Sub-Saharan-Africa-Working-but-Poor/Hino-Ranis/p/book/9780367868260

Babatunde, O., & Qaim, M. (2009). Patterns of income diversification in rural Nigeria: Determinants and impacts. *Quarterly Journal of International Agriculture*, *48*(4), 305–320.

Barrett, C. B., Reardon, T., & Webb, P. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. *Food Policy*, *26*(4), 315–331. https://doi.org/10.1016/S0306-9192(01)00014-8

Chauvin, N. D., Mulangu, F., & Porto, G. (2012). Food Production and Consumption Trends in Sub-Saharan Africa: Prospects for the Transformation of the Agricultural Sector. In *UNDP Africa Policy Notes* (2012–011; UNDP Africa Policy Notes, pp. 1–74). United Nations Development Programme, Regional Bureau for Africa. https://ideas.repec.org/p/rac/wpaper/2012-011.html

de Janvry, A., & Sadoulet, E. (2011). Income Strategies Among Rural Households in Mexico: The Role of Off-farm Activities. *World Development*, *29*(3), 467–480.

Diao, X., Harttgen, K., & McMillan, M. (2017). The Changing Structure of Africa's Economies. *The World Bank Economic Review*, *31*(2), 412–433. https://doi.org/10.1093/wber/lhw070

Diao, X., & Hazell, P. (2019). Ghana's Economy-wide Transformation: Past Parterns and Future Prospects. In X. Diao, P. Hazell, S. Kolavalli, & D. Resnick (Eds.), *Ghana's Economic and Agricultural Transformation: Past Performance and Future Prospects* (pp. 1–227). Oxford University Press. https://doi.org/10.1093/oso/9780198845348.001.0001

Diao, X., Magalhaes, E., & Mcmillan, M. (2018). Understanding the Role of Rural Non-Farm Enterprises in Africa's Economic Transformation: Evidence from Tanzania. *The Journal of Development Studies*, *54*(5), 833–855. https://doi.org/10.1080/00220388.2018.1430766

Dorsey, B. (1999). Agricultural Intensification, Diversification, and Commercial Production among Smallholder Coffee Growers in Central Kenya. *Economic Geography*, *75*(2), 178–195. https://doi.org/10.2307/144250

Duarte, M., & Restuccia, D. (2010). The Role of the Structural Transformation in Aggregate Productivity. *The Quarterly Journal of Economics*, *125*(1), 129–173. https://doi.org/10.1162/qjec.2010.125.1.129

Enache, M., Ghani, E., & O'Connell, S. (2016). *Structural Transformation in Africa: A Historical View* (Policy Research Working Paper 7743; pp. 1–76). The World Bank, Macroeconomics and Fiscal Management Global Practice Group. https://doi.org/10.1596/1813-9450-7743

Fields, G. (2015). Aid, Growth and Jobs. *African Development Review*, *27*(S1), 5–16. https://doi.org/10.1111/1467-8268.12135

Filmer, D., & Fox, L. (2014). *Youth Employment in Sub-Saharan Africa*. The World Bank. https://doi.org/10.1596/978-1-4648-0107-5

Fine, D., van Wamelen, A., Lund, S., Cabral, A., Taoufiki, M., Dörr, N., Leke, A., Roxburgh, C., Schubert, J., & Cook, P. (2012). *Africa at work: Job creation and inclusive growth*. McKinsey Global Institute. https://scholar.google.com/scholar_lookup?title=Africa%20at%20Work%3A%20Job%20Creation%20and%20Inclusive%20Growth&author=Fine%20D.&publication_year=2012

Gollin, D., Jedwab, R., & Vollrath, D. (2016). Urbanization with and without Industrialization. *Journal of Economic Growth, Forthcomming*.

Harris, J. R., & Todaro, M. P. (1970). Migration, Unemployment and Development: A Two-Sector Analysis. *The American Economic Review*, *60*(1), 126–142.

Harris, J., & Todaro, M. P. (1970). Migration, Unemploymentand DevelopmnentA : Two-Sector Analysis. *American Economic Review*, *60*, 126–142.

ILOSTAT. (2018). *ILO Data Explorer*. https://www.ilo.org/shinyapps/bulkexplorer17/?lang=en&segment=indicator&id=EAR_4MMN_CUR_NB_A

International Labour Organization (Ed.). (2014). *Developing with jobs* (2. ed. rev). ILO.

Islam, N., & Yokota, K. (2008). Lewis Growth Model and China's Industrialization. *Asian Economic Journal*, *22*(4), 359–396. https://doi.org/10.1111/j.1467-8381.2008.00282.x

ISSER. (2010). *The State of the Ghanaian Economy in 2009*. Institute of Statistical, Social and Economic Research (ISSER).

La Porta, R., & Shleifer, A. (2014). Informality and Development. *Journal of Economic Perspectives*, *28*(3), 109–126. https://doi.org/10.1257/jep.28.3.109

Lambon-Quayefio, M. (2017). Non-Farm Enterprises and the Rural Youth Employment Challenge in Ghana. *IDS Bulletin*, *48*(3), Article 3. https://doi.org/10.19088/1968-2017.130

Lesthaeghe, R. (2014). *The fertility transition in Sub-Sahara Africa into the 21st Century* (14–823). The fertility transition in Sub-Sahara Africa into the 21st Century rr14-823 SS AFRICThe fertility transition in Sub-Sahara Africa into the 21st Century rr14-823 SS AFRICPopulation Studies Center, University of Michigan, Institute for Social Research''.

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *The Manchester School of Economics*, *22*(2), 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

McMillan, M., Rodrik, D., & Verduzco-Gallo, Í. (2014). Globalization, Structural Change, and Productivity Growth, with an Update on Africa. *World Development*, *63*, 11–32. https://doi.org/10.1016/j.worlddev.2013.10.012

Osei, R. D., & Jedwab, R. (2016). Structural change in a poor African country: New historical evidence from Ghana. In M. S. McMillan, D. Rodrik, & C. Sepúlveda (Eds.), *Structural change, fundamentals, and growth: A framework and case studies* (pp. 161–196). International Food Policy Research. http://dx.doi.org/10.2499/9780896292147_ch4

Osei-Boateng, C., & Ampratwum, E. (2011). *The informal sector in Ghana*. Friedrich Ebert Stifung, Ghana Office. http://library.fes.de/pdf-files/bueros/ghana/10496.pdf

Otoo, K. N. (2019). *Informality and Labour Regulations in Ghana* (C. Scherrer, Ed.; Vol. 16). Rainer Hampp Verlag.

Oyelaran-Oyeyinka, O., & Ola-David, O. (2017). Structural Transformation in Nigeria: Steering Foreign Direct Investment towards Inclusive Growth. In Alabi, Gutowski, Knedlik, Oyelaran-Oyeyinka, & Wohlmuth (Eds.), *Africa's Progress in Regional and Global Economic Integration: Towards New Trade and Investment Policies* (Vol. 19, pp. 207–250). LIT-Verlag.

Page, J., & Shimeles, A. (2015). Aid, Employment and Poverty Reduction in Africa. *African Development Review*, *27*(S1), 17–30. https://doi.org/10.1111/1467-8268.12136

Ranis, G., & Fei, J. C. H. (1961). A Theory of Economic Development. *The American Economic Review*, *51*(4), 533–565. JSTOR.

Rapley, J. (2007). *Understanding development: Theory and practice in the third world* (3rd ed). Lynne Rienner Publishers.

Sackey, H. A., & Osei, B. (2006). Human Resource Underutilization in an Era of Poverty Reduction: An Analysis of Unemployment and Underemployment in Ghana. *African Development Review*, *18*(2), 221–247. https://doi.org/10.1111/j.1467-8268.2006.00140.x

Senadza, B. (2012). Non-farm Income Diversification in Rural Ghana: Patterns and Determinants. *African Development Review*, *24*(3), 233–244. https://doi.org/10.1111/j.1467-8268.2012.00322.x

Sparreboom, T., & Gomis, R. (2015). *Structural change, employment and education in Ghana* (Working Paper 193; Employment, pp. 1–50). International Labour Office, Employment Policy Department, Employment and Labour Market Policies Branch. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_444515.pdf

StataCorp. (2021). *STATA Manual*. StataCorp LLC. https://www.stata.com/manuals/svysvy.pdf

United Nations (Ed.). (2008). *International Standard industrial classification of all economic activities (ISIC)* (Rev. 4). United Nations. https://www.bundesbank.de/resource/blob/612626/067f5294c6df434ea4528bdb62551f9b/mL/isic-rev-4-data.pdf

United Nations. (2020). *World Population Prospects 2019 - Volume II: Demographic Profiles*. UN. https://doi.org/10.18356/7707d011-en

Wang, X., & Weaver, N. (2013). Surplus labour and Lewis turning points in China. *Journal of Chinese Economic and Business Studies*, *11*(1), 1–12. https://doi.org/10.1080/14765284.2012.755303

World Bank. (2010). *Education in Ghana: Improving Equity, Efficiency and Accountability of Education Service Delivery*. World Bank. https://openknowledge.worldbank.org/handle/10986/3012

World Bank. (2020, June 20). *World Development Indicators | DataBank*. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators

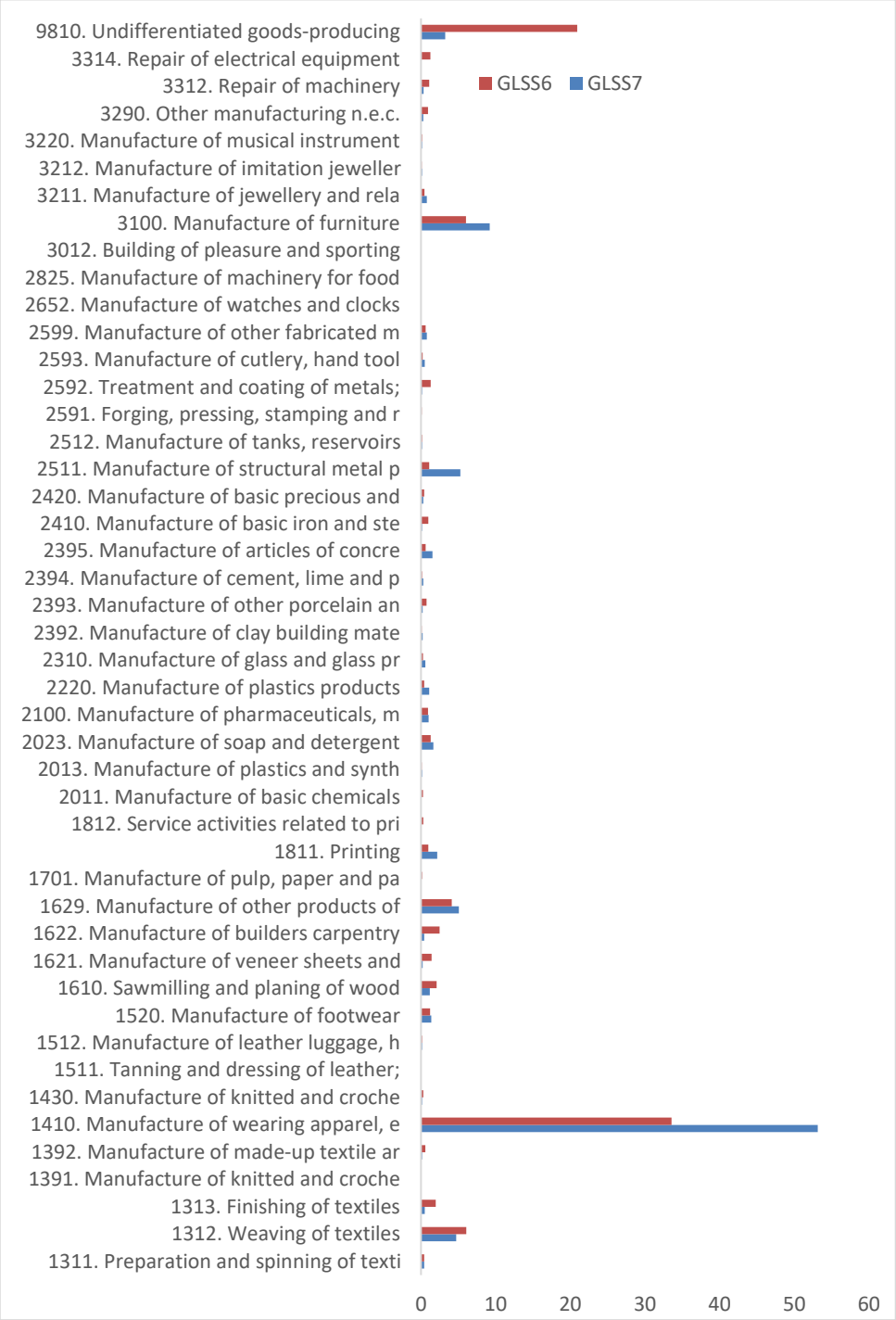
World Bank Group. (2015). *Governance and Finance Analysis of the Basic Education Sector in Nigeria*. World Bank. https://openknowledge.worldbank.org/handle/10986/23683

Yamada, G. (1996). Urban Informal Employment and Self-Employment in Developing Countries: Theory and Evidence. *Economic Development and Cultural Change*, *44*(2), 289–314. https://doi.org/10.1086/452214

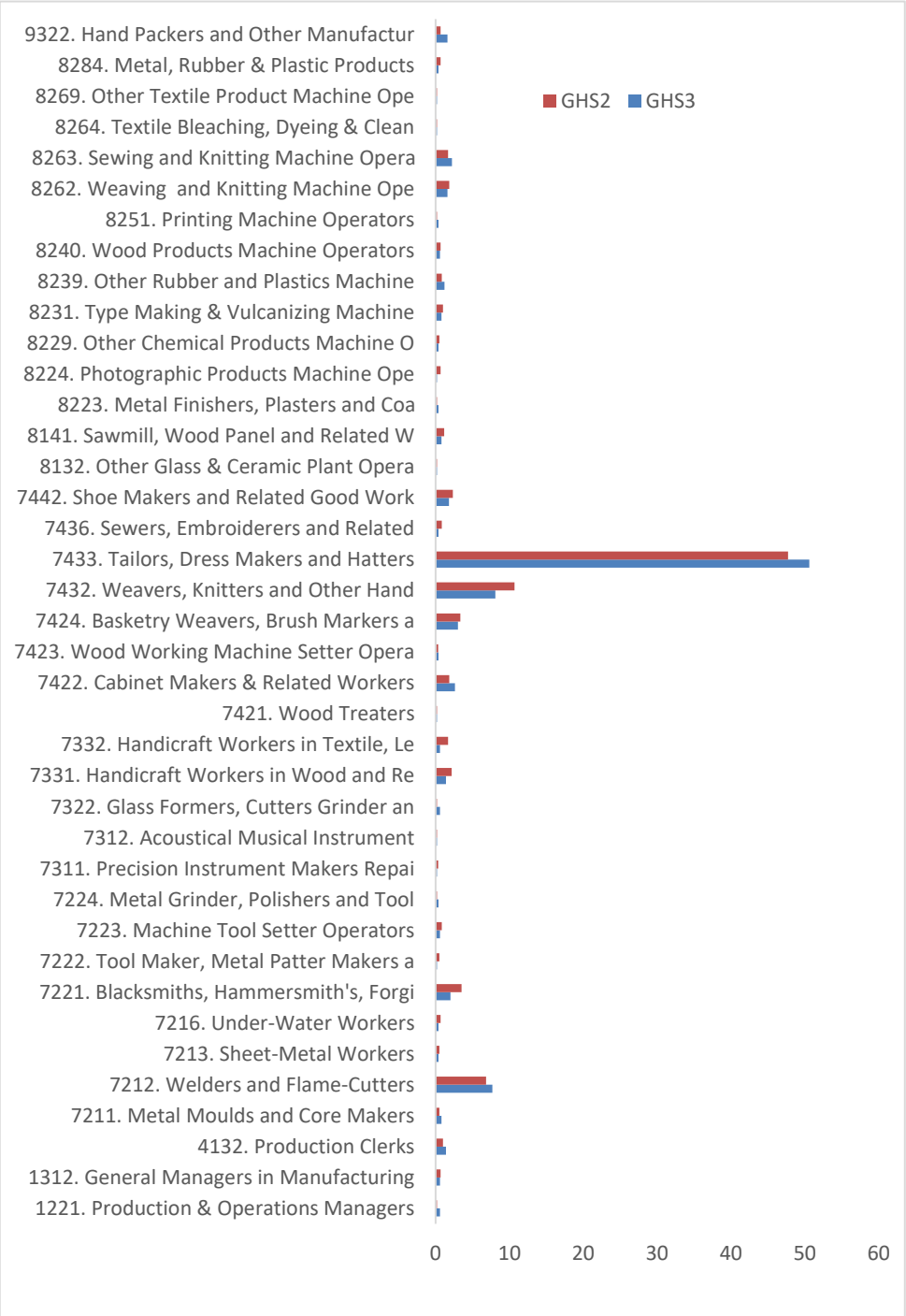
Yeboah, F. K., & Jayne, T. S. (2018). Africa's Evolving Employment Trends. *The Journal of Development Studies*, *54*(5), 1–30.

4.7 Appendix 1: Composition of the manufacturing sector

Ghana



Nigeria


9322. Hand Packers and Other Manufactur
8284. Metal, Rubber & Plastic Products
8269. Other Textile Product Machine Ope
8264. Textile Bleaching, Dyeing & Clean
8263. Sewing and Knitting Machine Opera
8262. Weaving and Knitting Machine Ope
8251. Printing Machine Operators
8240. Wood Products Machine Operators
8239. Other Rubber and Plastics Machine
8231. Type Making & Vulcanizing Machine
8229. Other Chemical Products Machine O
8224. Photographic Products Machine Ope
8223. Metal Finishers, Plasters and Coa
8141. Sawmill, Wood Panel and Related W
8132. Other Glass & Ceramic Plant Opera
7442. Shoe Makers and Related Good Work
7436. Sewers, Embroiderers and Related
7433. Tailors, Dress Makers and Hatters
7432. Weavers, Knitters and Other Hand
7424. Basketry Weavers, Brush Markers a
7423. Wood Working Machine Setter Opera
7422. Cabinet Makers & Related Workers
7421. Wood Treaters
7332. Handicraft Workers in Textile, Le
7331. Handicraft Workers in Wood and Re
7322. Glass Formers, Cutters Grinder an
7312. Acoustical Musical Instrument
7311. Precision Instrument Makers Repai
7224. Metal Grinder, Polishers and Tool
7223. Machine Tool Setter Operators
7222. Tool Maker, Metal Patter Makers a
7221. Blacksmiths, Hammersmith's, Forgi
7216. Under-Water Workers
7213. Sheet-Metal Workers
7212. Welders and Flame-Cutters
7211. Metal Moulds and Core Makers
4132. Production Clerks
1312. General Managers in Manufacturing
1221. Production & Operations Managers
GHS2
GHS3
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10
20
30
40
50
60

Chapter 5
Food processing activities by farm households in Ghana under varying land constraints and levels of regional development[1]

Abstract:

On-farm food processing is a relevant livelihood strategy for farm households most especially for those constrained by land endowments. In this study, we investigate the factors influencing farm households' participation and intensity of household labour use in on-farm food processing as alternatives arise. The study relies on two rounds of the Ghana Living Standard Survey and the Heckman selection model. Results show that the likelihood of household participation in food processing is larger for land-constrained, asset-rich farm households and married household heads. The extent of farm household labour participation in processing is higher for asset-rich households but low for male-headed households, households with higher average education and a high dependency ratio. Food processing frequency and intensity correlate negatively with regional economic development measured as income per capita and rural electrification. The implication is that farm households choose other gainful activities than food processing as the economy develops. Urbanisation encourages the likelihood of farm households' participation in food processing activities. The results suggest the importance of land constraints in the participation of farm households in food processing in the development process.

[1] A part of this chapter is submitted to an international multi-disciplinary journal as; Agyei-Sasu F., Heckelei, T., Kuhn, A.: Food processing activities by farm households in Ghana under varying land constraints and levels of regional development. An earlier version was accepted conference paper for poster presentation at the EAAE 2021 virtual conference in Prague, Czech Republic.

Keywords: households, food processing, land constraint, development, Heckman, Ghana

5.1 Introduction

Economic growth in most developing countries goes with intersectoral transitions (in terms of labour and income) and rapid urbanization supported by increasing population growth. In the process, agriculture's contribution to both gross domestic product (GDP) and total labour force employed declines as workers move out of agriculture into industry and services sectors(Diao et al., 2017; Rodrik, 2018) due to better wages and standard of living (J. R. Harris & Todaro, 1970; Islam & Yokota, 2008; Wang & Weaver, 2013).

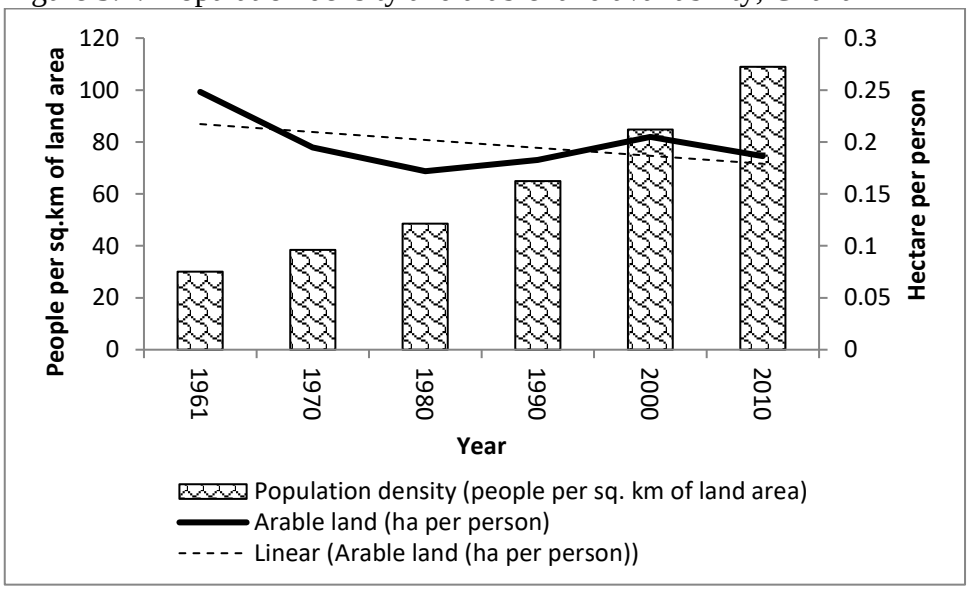
Transitioning from the agriculture sector to other sectors is characterised by the outmigration of farm labour, increased commercialisation, and specialisation of farming. The population of smallholder farm households declines along the line. Nonetheless, like in most of Sub-Saharan Africa (SSA), small subsistence farm households still dominate the farming sector in Ghana, where about 79 percent of farm holdings are small farms (farming on average farm size of 1.56 hectares and usually less than 2 hectares) (Food and Agriculture Organization (FAO), 2017; Statistics, Research and Information Directorate (SRID), 2016). In Ghana, among other factors, the transition of the smallholders to commercial farming is constrained by the land tenure system - a majorly communally owned (Lambrecht & Asare, 2016).

Further, the convergence of population growth of 2% and urban growth of 3.1% per annum in Ghana in 2021 (World Bank, 2020) has resulted in a demographic shift, which has pushed for transformation in the dietary preferences of Ghanaian consumers. Households are increasingly shifting to more diversified diets, easy-to-cook, and highly palatable meals (Allen et al., 2018). Indeed, the consumption patterns and time constraints of urban dwellers have necessitated the replacement of foods with long preparation times with (semi) processed foods (Acquaye et al., 2021). These developments, which affect all countries of the sub-region as well as all income groups, have increased the consumption of processed, high-value-added foods derived from perishable agricultural products (Reardon, 2015; Staatz & Holliger, 2016). These developments and other internal factors are likely spur farm labour participation in food processing.

Again, rapid urbanisation growth rate and economic development increase pressure on available land and thus reduce cropland per capita, especially for households closer to

urban centres (Diao, Magalhaes, et al., 2019b) (see figure 5.1). The marginal productivity of the farm household labour declines and frees up labour for other sectors outside the farming activities (Lewis, 1954). In Ghana, they constitute more than 70 percent of identified migrants in urban centres (Ackah & Medvedev, 2012). Suffice it to mention that not all farm labour can migrate or find employment in urban centres. Diversification into food processing at the farm level will make effective use of the available local resources in terms of human resources and farm produce (Kindness & Gordon, 2001; Owoo & Lambon-Quayefio, 2018; E. T. Quartey & Darkwah, 2015). Additionally, on-farm food processing has the potential to keep household labour economically engaged throughout the year.

Figure 5.1: Population density and arable land availability, Ghana



Source: Estimates from WDI database (2020)

The diversification of production systems and the promotion of alternative livelihood activities of farm households in terms of processing have been part of national agricultural policies in Ghana. The policy aims to support poor subsistence farmers in the diversification process (e.g. see Ministry of Food and Agriculture (MoFA), 2015, 2018, 2019). Often, these policies are formulated with inadequate knowledge of farm household behaviour in a short to medium term in a given economy-wide development. This study fills this gap by identifying the factors that will determine farm households' decision to participate in such policies and the number of farm labour they will commit to food processing activities.

Farm household food processing[2] is usually traditional, and artisanal activity. It concerns all food groups including cereals, roots and tubers, legumes, oilseeds, fruits, meat and fish, dairy products, and condiments. It plays an important dual role as a means of food security and as a source of employment and income (Allen et al., 2018). Farm household food processors rely on local and fabricated equipment such as compressors, local wooden/charcoal stoves, and industrial-level utensils (aluminium pots) for their processing activities. The act of food processing has been among farm households and is passed on from generation to generation to preserve agricultural commodities and provide daily meal needs. Family labour accounts for a large proportion of total labour costs in food processing activities at the farm household level but is not recorded by peasant/small-scale farmers in their farm budgets or operating accounts (Mayer & Glave, 2008) or by the producers of processed foods themselves (Kpossilande et al., 2020).

Farm household food processing at various levels of primary and secondary occur in the daily lives of farm households in Ghana. Depending on the agricultural commodity, it involves salting, drying, milling, smoking, grilling, roasting/frying, boiling, fermenting and other activities that transform raw agricultural commodities. Farm household food processing provides ready-to-consume meals, preserves and extends the shelf life of farm produce and thus allows for extended distribution and marketing opportunities (Acquaye et al., 2021; Bricas & Broutin, 2008). Generally, food processing is vital for women at a level of post-harvest activities, and trading, whilst the men focus on the main farming activities (Acquaye et al., 2021). In seven West African countries (Ghana, Burkina Faso, Mali, Nigeria, Niger, Ivory Coast, and Senegal), food processing employs about 83% of the labour force on average in the sub-sector.

The remainder of the paper is structured as follows. In the following section, we present a description of food processing in the context of this study. We then provide a theoretical framework and a review of empirical studies on the determinants of agro-processing in sections 5.3 and 5.4. Section 5.5 describes the methodology, section 5.6 discusses the results, and section 5.7 concludes the study.

5.2 **Food processing in the context**

Food processing involves all activities that transform plant and animal raw materials (primary produce) and their intermediate products into a final finished product that is

[2] In this study, we consider scaled-up farm-level food processing with market participation intentions

its possible highest end of value addition. Agro-processing is part of the industrial sector and a subset of manufacturing. Agro-processing may vary from a less capital-intensive activity, such as sun drying agro products, to a more capital-intensive process (Food and Agriculture Organization (FAO), 1997).

In some cases, agro-processing firms are categorised by the market source of their raw products and the market for their finished products. They are either users of imported agricultural commodities to be processed and sold on the local market (global to local), users of locally produced agricultural commodities to be processed and exported (local-to-global) or users of locally produced agricultural commodities to be processed and sold on the domestic market (local-to-local) (Food and Agriculture Organization (FAO), 1997). Local-to-local and, to some extent, local-to-global firms dominate the agro-processing sub-sector in Ghana (Owoo & Lambon-Quayefio, 2018). Further, agro-processing firms could be grouped by their scale of production; small, medium, and large. Small and medium-scale firms dominate the Ghanaian agro-processing sub-sector. The small and medium-scale firms are mostly informal with a significant share of female workers. Skills and training in small and medium-scale agro-processing operations are acquired through apprenticeship either within or outside a household. Large-scale processors, on the other hand, are formalized and are mostly located in cities and towns. They could be foreign-owned (e.g., Nestlé and Cadbury) or state-owned (e.g. Fan Milk) or with a conglomeration of different ownership structures (e.g. public private partnership). They are capable of processing large quantities of raw materials and can contribute significantly to the nation's economy through export activities (Owoo and Lambon-Quayefio, 2018; Quartey and Darkwah, 2015). In the following, we focus on key features of the agro-processing sub-sector with particular attention to small and medium-scale processing activities for farm households that engage in agro-processing activities.

5.2.1 **Processed commodities**

Agro-processed products from farm households are presented in Table 5.1. The products are categorised into staple and non-staple foods based on the type of agricultural raw agro-product processed. Expectedly, staple foods which form the major component of daily food needs are processed more than non-staple foods. Maize products are found to be the most processed agricultural commodity among all other staple foods. Processed maize is more than 50 percent of products processed in both GLSS6 and GLSS7 surveys. Among the processed maize products, maize flour is the most common processed output (43% for GLSS6 and 44% for GLSS7). The maize plant do well in all the climatic zones of Ghana, it is one of the key staple foods and

the most widely consumed staple cereal in Ghana (Morris et al., 1999). Milling the maize grains is usually done with locally fabricated grinders; an improvement from stone grinders, and mortar and pestle (Owoo & Lambon-Quayefio, 2018).

Processed cassava products account for about 20 percent of agro-processed staple food products in GLSS6 as well as GLSS7. While cassava flour is the most processed product (about 10%) in GLSS6, cassava dough comes up top (about 10%) in GLSS7. The cassava crop is an important commodity among root and tubers processed in Ghana because of its high perishability and its wide consumption. Although cassava does not thrive in all the agro-climates of Ghana, processed products from cassava are used extensively and therefore create the needed domestic demand. Graters, cassava chippers, screw presses, hydraulic presses, cassava dough disintegrators, sieving machines, grading machines, plate mills, hammer mills and mechanical dryers are some of the local pieces of equipment used in cassava processing. These new technologies have been adopted, especially at the medium and small-scale levels (Owoo & Lambon-Quayefio, 2018).

Non-staple processed foods are usually the protein, oils and condiments part of the daily meal. In table 5.1, groundnut paste (31%), shea butter/oils (18%), and cooking oils (10%) are the three most processed products for the sixth-round survey (GLSS6). From the current survey (GLSS7), processed fish (26%) is the most non-staple food processed in addition to cooking oils (18%) and shea butter/oils (13%). Smoking and drying of fish are the most commonly used technique for processing fish in Ghana. Fishes are processed the traditional way with an improvement in the practice such as the adoption of "Chokor smokers". Processing of fish has traditionally been the main occupation of women in fishing communities whiles the act of fishing is a man's duty. Cooking oil (including palm oil) and shea butter/oil processing is mainly undertaken by women and comprises the tasks of pounding/milling, kneading, washing and cream boiling, which is all carried out with very simple household equipment such as mortar and pestle, cooking pot/pan (Addaquaye, 2004).

Table 5.1: The categories and types of processed products

		GLSS6 (2012/13)		GLSS7 (2016/17)	
Category	**Processed products**	**Freq.**	**Percent**	**Freq.**	**Percent**
Staple foods	Cassava flour	1,317	10.11	453	6.76
	Cassava chips	159	1.22	64	0.96
	Cassava dough	1,053	8.08	720	10.74
	Gari	189	1.45	166	2.48
	Maize flour	5,652	43.39	2,950	44.02
	Corn dough	2,934	22.52	1,450	21.64
	Husked/milled /polished rice	503	3.86	189	2.82
	Flour from other grains	1,220	9.37	709	10.58
	Total	13,027	100	6,701	100
Non-staple foods	Groundnut paste	810	31.97	110	9.35
	Shea butter	454	17.92	148	12.57
	Cooking oils	263	10.38	209	17.76
	Home-brewed drinks	141	5.56	32	2.72
	Processed fish	255	10.06	305	25.91
	Processed meat	121	4.78	36	3.06
	Other	490	19.34	337	28.63
	Total	2,534	100	1,177	100

Source: Estimation from GLSS 6 and 7 (GSS, 2012/13, 2016/17)

5.2.2 **Sources of processed commodities**

On-farm agro-processors usually use harvested crops or animal products from their household production and transform them into more attractive, marketable and often longer shelf life agro-products for final consumers or other intermediate use. The raw materials could also be sourced from other producers outside the household in cases where it is economically viable. Farm processors usually rely on household labour and

is a predominantly rural-based. The source of raw products for processing is presented in table 5.2 for specific agro-processed product(s).

It is found that most of the staple foods processed by the processors are sourced from within the farm household. A Significant amount of cassava products (more than 70 percent) and maize products (more than 55%) are from farm households' production. Except for home-brewed drinks, processed fish and meat that have a significant share of raw materials sourced from outside the household (over 50%), all other processed products from the farm households are majorly sourced from within the household.

Table 5.2: Sources of raw materials for processed products.

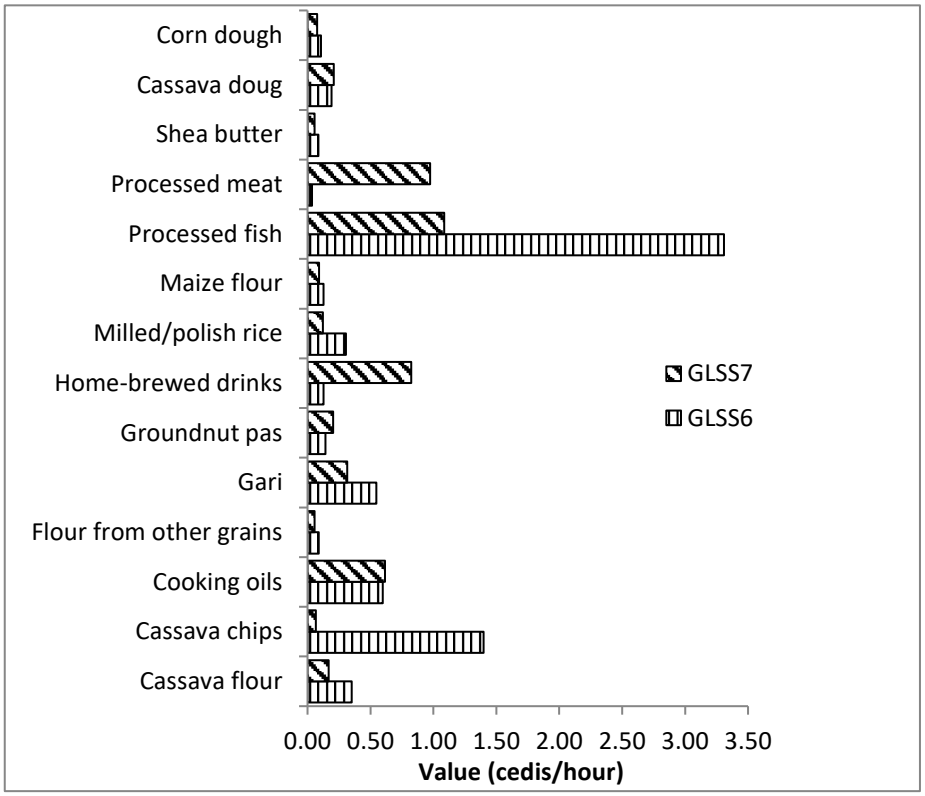
	Sources of raw material (GLSS6)				Sources of raw material (GLSS7)				
Products	**Own Produce**	**Purchased**	**Gift**	**Other**	**Own Produce**	**Purchased**	**Gift**	**Other**	**Total**
Cassava flour	78.32	19.23	2.32	0.13	74.14	24.57	1.29	0.00	**100**
Cassava chips	88.00	12.00	0.00	0.00	72.22	22.22	5.56	0.00	**100**
Gari	83.87	16.13	0.00	0.00	78.46	15.38	6.15	0.00	**100**
Cassava dough	88.13	10.65	1.05	0.17	83.38	12.85	3.78	0.00	**100**
Maize flour	65.04	32.54	2.33	0.09	58.68	38.16	2.72	0.45	**100**
Corn dough	58.99	36.86	4.08	0.06	55.56	39.17	5.13	0.14	**100**
Husked/polished rice	78.54	19.02	2.44	0.00	78.87	18.31	2.82	0.00	**100**
Flour from other grains	84.98	13.58	1.28	0.16	75.57	23.06	1.37	0.00	**100**
Groundnut paste	72.98	25.78	1.24	0.00	72.41	27.59	0.00	0.00	**100**
Shea butter	64.86	22.30	5.41	7.43	32.50	40.00	0.00	27.5	**100**
Cooking oils	80.41	17.53	2.06	0.00	73.13	17.91	7.46	1.49	**100**
Home-brewed drink	50.00	50.00	0.00	0.00	38.10	61.90	0.00	0.00	**100**
Processed fish	40.35	52.63	2.92	4.09	26.92	60.90	8.97	3.21	**100**
Processed meat	30.43	69.57	0.00	0.00	0.00	88.89	11.11	0.00	**100**
Total	**68.01**	**29.28**	**2.43**	**0.28**	**62.24**	**33.85**	**3.30**	**0.62**	**100**

Source: Estimation from GLSS 6 and 7 (GSS, 2012/13, 2016/17)

5.2.3 **Value of agro-processed products**

The value of agro-processed products is the ratio of estimated annual net sales and labour time used by the proprietor. In general, processed fish, cassava chips, and cooking oil processing yielded much value per hour spent in their respective rank order (Figure 5.2). Processing of fish (GHS 3.31), cassava chips (GHS 1.40), and cooking oils (GHS 0.60) had the highest per-hour labour input in respective order in the GLSS6 survey. In the GLSS7 survey, processed fish (GHS 1.09), processed meat (GHS 0.97), and home-brewed drinks (GHS 0.82) were reported to be the three most valuable processing activities. Processing activities that could be said to have had many appreciable gains between the two surveys were the processing of meat and home-brewed drinks.

Figure 5.2: Value of agro-processed products



Source: Estimation from GLSS 6 and 7 (GSS, 2012/13, 2016/17)

5.3 Theoretical framework

Traditional theory on structural change stipulates a steady shift in the labour force from farm to non-farm activities, slowing population growth in rural communities and uptake of commercial farming activities (Lewis, 1954). In SSA, farm labour migration to urban centres, and the development of the non-farm sector is typically centred around rural surplus labour (Scully & Britwum, 2019) in particular is the case where farm endowments such as land are constrained due to rising land values following increasing land scarcity and accessibility issues (Jayne et al., 2019). Consequently, farm household labour is encouraged to migrate or find an effective and alternative use for their labour resource (Scherrer, 2018). One alternative for farm household surplus labour is to seek off-farm employment by diversifying into agro-food processing. At the thick of it is the increasing population with a limited amount of farmland which comes about in the form of competing use of land and land tenure issues as a region develops.

The theoretical framework draws on the household utility maximisation and related labour supply model. In theory, the labour supply decision of the household maximises the utility of income and other factors subject to the constraints of market wage and worker characteristics (Sadoulet and de Janvry, 1995). The central assumption is that the household faced with alternative use of household labour will choose to allocate labour to activities that maximize the expected utility of the outcome. Therefore, the household will do inward and outward assessments of existing alternatives of labour use (Nicholson & Snyder, 2012; Sadoulet & de Janvry, 1995). This study seeks to understand how strongly regional economic growth and land scarcity at the farm level in addition to other covariates influence a household's decision to process agricultural produce (participation decision) and the share of household members committed to the processing activity (intensity of food processing) conditional on participation.

We refrain from developing a full theoretical model in this paper, as the theory underlying our empirical specification below is well known. For a more formal treatment of deriving behavioural labour supply equations to labour use activities from the farm-household utility maximisation model see Sadoulet and de Janvry (1995) and Key, Sadoulet and de Janvry (2000).

In its generality, a farm household will diversify labour into agro-processing only if the utility gain is higher than in other alternative occupations. If U_f and Up is the utility of non-participation and participation, respectively, a farm household i participates in agro-food processing if $y^* = Up - U_f > 0$ and does not participate

otherwise. In short, we can define the binary variable indicating participation as it can be

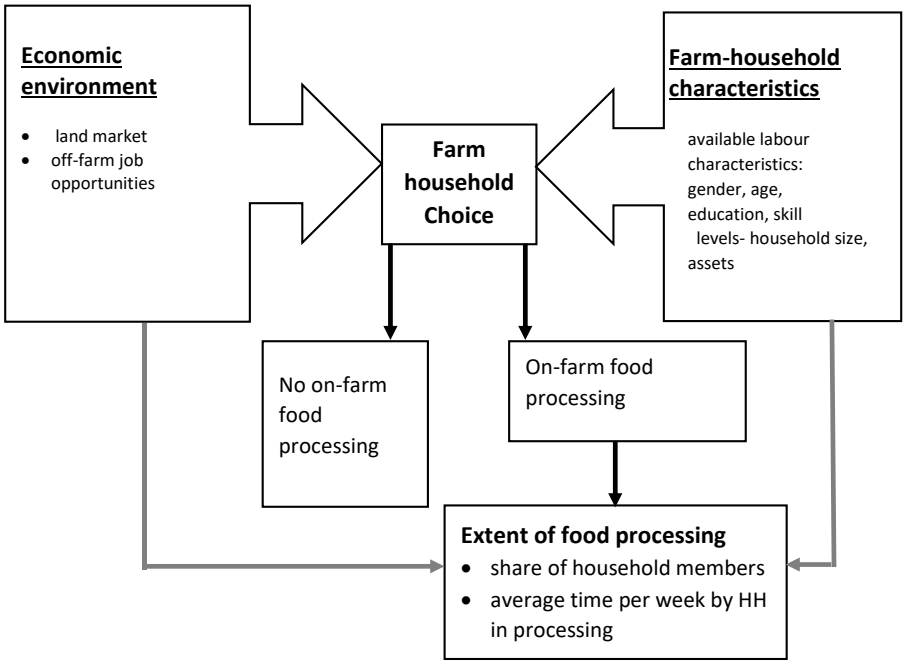
$$y = \begin{cases} 1, & if\ y^* > 0 \\ 0, & y^* \leq 0 \end{cases} \quad (1)$$

The intensity of food processing observed among participating households is equal to y^*.

To re-emphasise, the joint impact of farm household characteristics and economic environment determines the choice to participate in on-farm food processing activities. Relevant factors in the farm household's economic environment are land market conditions driven by population pressure, economic development, urbanisation and rural electrification (e.g., Kassie et al., 2017). The socioeconomic conditions of the farm household define the available labour resources regarding quantity, quality and preferences as well as other assets relevant to the attractiveness of alternative occupational choices (Fernández-Arias, 1994).

Schematically, a farm household's decision to participate in farm food processing is expressed in Figure 5.3. The economic environment and farm household characteristics affect farm household economic choice of producing only agricultural raw produce or in addition, processing farm commodities. The factors that are envisaged to affect participation decisions may also influence the extent of household participation in on-farm food processing activities.

Figure 5.3: Framework of farm household decision making



Source: Author's concept

5.4 **Empirical evidence on determinants agro-processing**

On-farm agro-processing is one of the diversification strategies among farm households. Consequently, the factors that determine farm household diversification are generally likely to influence the decision to participate in agro-processing. Empirical studies on farm household diversification underscore the role of socio-demographics, economic conditions and institutions as the main determinants of household choice. For instance, a positive effect of education on livelihood diversification of agricultural producer households is identified in Western Kenya (Olale & Henson, 2012), Southern Ethiopia (Eneyew, 2012), West Bengal, India (Khatun & Roy, 2012) and Ghana (Asmah, 2011). In other studies, researchers find a positive and significant effect of age, asset value, membership to an association, training, access to public transport, access to markets including the capital, and access to electricity on the farm/rural household diversification decision (Saha and Bahal, 2010; Abdul-Hakim and Che-Mat, 2011; Asmah, 2011; Eneyew, 2012; Khatun and Roy, 2012; Olale and Henson, 2012; Senadza, 2012). A negative and significant effect

of household size, dependency ratio, land-man ratio, and farming experience has also been found (Eneyew, 2012; Khatun & Roy, 2012).

Several empirical studies identifying drivers of diversification to food processing by farm households find that both human (previous education and experience) and social capital have a positive and significant influence on agro-processing participation in South Africa (Thindisa & Urban, 2018). They further highlight the importance of market access and transaction costs for small-scale "agripreneurs". Kuwornu et al., (2014) use a multinomial logit model on cross-sectional data from the Upper West Region of Ghana to identify determinants of farm household livelihood diversification into agro-processing and non-agro-processing activities. They find that educated and asset-rich farmers are more likely to diversify into agro-processing. This finding is commonly interpreted such that a better education enables households to engage in agro-processing activities beyond agricultural production (ibid, p.197).

For the Gauteng province of South Africa, Mthombeni *et al.*, (2021) use a multinomial logit analysis and find that access to credit, distance to market, farm size and educated farmers positively and significantly influence the likelihood of participation in agro-processing. Credit constraints hinder capital accumulation to aid production expansion and investment in other economic activities. Crop farmers who are further apart from the main market are more likely to process their agricultural commodities, which is plausible according to the authors as agro-processing in the study area is undertaken to increase shelf life. In the same Provence in South Africa, Khoza et al., (2019) analyse the factors that determine the participation of smallholder farmers in agro-processing as well as the extent of participation using a double hurdle approach. They find that educational level, land tenure, and agro-process training have a positive influence on the decision to participate. On the other hand, distance to market and off-farm income negatively influence the decision to participate. The level of farm household participation is influenced by age, household size, educational level, grain and livestock producers, farm size and access to training.

In summary, the empirical studies in most cases confirm the role of socio-demographic and economic factors to explain participation in agro-processing. Demographic factors frequently identified include household size, educational status, age, and gender; economic factors include income, assets, access to credit and farm size. There are also institutional aspects such as membership in an association, and market access. Although the factors identified and the methodologies used are not exhaustive, our study will add to the current literature on the subject matter. Most particularly, our methodology uniquely combines the choice to participate in agro-processing and its

intensity in one model while accounting for sample selection (i.e. accounting as well for farm households who do not engage in agro-processing) and endogeneity of covariates. The work of Khoza et al., (2019) is one of the examples which use a double hurdle approach to analyse factors influencing the decision to participate and the level of participation in agro-processing. The study falls short in addressing endogeneity in the covariates.

5.5 Methodology

5.5.1 Empirical framework

Farm households self-select into food processing activities which may cause a bias when analysing the determinants of choice and intensity of food processing. The use of separate models for determinants of participation and degree of participation will be inefficient in representing the entire farm household population – i.e. including those who do not participate in food processing (Heckman, 1979). The Heckman two-stage sampling is therefore used. It involves estimating a probit equation (selection equation) to identify factors that influence the likelihood of farm household participation, and, in a second stage, uses ordinary least squares (OLS) (outcome equation) to establish the factors that influence the degree of participation (intensity) in agro-processing.

The first stage equation is a probit model expressed as follows:

$$P(y = 1|x_1, \delta_{7i}D_i) = \phi(\beta_0 + \beta_1 x_1 + \beta_2 \delta_{7i} + v_i) \qquad (2)$$

where:

y is a binary dependent variable; 1=participant, 0=non-participant

x_1 is a vector of household-level and district-level covariates

v_i is normally distributed error terms [$v_i \sim N(0,1)$]

δ_{7i} is the survey wave dummy variable (δ_{7i} equal to 1 if the source of data is from the GLSS7 survey and 0 if the source is from GLSS6).

D_i is the district fixed effect used in the model to control for unobserved heterogeneity between the districts.

The second stage uses the OLS estimation technique with a truncated dependent variable, $y_{Pi}^{*}$is expressed as:

$$y_{Pi}^{*} = \alpha_0 + \alpha_1 x_{12} + \alpha_2 \delta_{7i} + i.D_i + u_i, \quad (3)$$

where:

y_{Pi}^{*} represents farm household's processing activities.

x_{12} is a vector of household-level and district-level covariates ($x_{12} \subset x_1$)

u_i is a normally distributed error term [$u_i \sim N(0, \sigma^2), corr(v_i, u_i) = \rho$]

ρ in the conditions of the error term represents the correlation between the estimated error terms. The products of ρ and σ^2 represent the inverse Mills ratio –the estimated selection coefficient.

The two-step procedure (limited-information maximum likelihood) is used because it provides estimates of the "structural" variance-covariance parameters of the unconditional distribution of the error terms (Leung & Yu, 1996; X. Xu et al., 2017). A more detailed explanation and estimation procedure of the Heckman model with endogenous covariates is provided in the works of Schwiebert (2015).

5.5.2 **Hypothesis**

The following definitions of the dependent variables apply: the binary variable representing participation in farm household food processing y (equation 2) is equal to 1, if at least one farm household member processes agricultural raw material with market participation as a motive, and 0 otherwise. The intensity of household members involved in food processing y_{Pi}^{*} is a continuous variable that measures the ratio of the total number of individuals in an agricultural household who engage in the processing of agricultural produce relative to the total number of adult household members, expressed as a percentage. Explanatory variables selected for analysis and the related hypothesis concerning their impact on the dependent variables are described in the ensuing.

Land-man ratio ($\boldsymbol{HH_{Land_{cs}}}$) is the ratio of available agricultural land[1] in hectares to the number of working-age (15 to 64 years) household members. This variable is used

[1]Available agricultural land includes both cultivated and uncultivated agricultural lands.

as a proxy for the household's land constraint, one of the key variables in our analysis. It also provides a discussion on farm household surplus labour. A reduction in the land-man ratio causes pressure to be on household land, which in turn results in low or zero marginal labour productivity (a form of disguised unemployment). Consequently, land-constrained agricultural households are assumed to look for other productive uses of their surplus/free labour (Headey et al., 2014) in the non-farm sector by diversifying (Khatun & Roy, 2012). We thus hypothesize a negative relationship between food processing and the land-man ratio.

Household asset value ($lnHH_{asset}$)[2] is the average value of all tangible possessions of the household in monetary terms. An asset is a form of storing wealth and provides opportunities for investment into alternative enterprises. Low asset endowment creates an entry barrier to diversifying into potentially lucrative enterprises for poor households (Habiyaremye & Mupela, 2019; Kuwornu et al., 2014). Therefore, we hypothesize a positive relationship between participation in food processing and household asset value.

Gender of household head ($HH_{hGender}$) is a binary variable that indicates the gender categorisation of a household's head. A household is assigned the value of 1 if the head is a male and 0 for a female-headed household. Most of the rural traditional agro-food processing in Ghana is done by females (Afful-Koomson et al., 2015). Female-headed households are therefore more likely to diversify into food processing (Khoza et al., 2019). and we consequently hypothesize a negative relationship between food processing and male-headed households.

Household education (HH_{educd}) is the average of the years of completed formal education of all members of the household. Education increases the level of household diversification by increasing the opportunity to start other livelihood options than primary agricultural production (Asmah, 2011; Babatunde & Qaim, 2009; Eneyew, 2012) from the awareness and the human capital it creates. The relationship between FHFP and farm household education level is hypothesized to be positive.

Household dependency ratio ($HHdep_{ratio}$) is the ratio of household members who are less than 15 years of age or more than 64 years of age to working-age household members (15 to 64 years) in percentage. It indicates the farm household's ability to

[2] Farm households were made to list all assets they possess which ranged from farm assets (e.g. farm implements, livestock, plantations etc.) and non-farm assets (e.g. television, bicycle, furniture etc.). The cost estimate of these assets in the current market value constitutes the household asset value.

meet their consumption needs and as dependency increases, there will be a drive to diversify into non-farm enterprises to meet household needs. However, households with a high dependency ratio will have relatively less surplus labour to commit to the new enterprise. Earlier empirical studies established a negative relation between household livelihood diversification into non-farm enterprises and dependency ratio (Abdul-Hakim & Che-Mat, 2011; Khatun & Roy, 2012). The dependency ratio is hypothesised to have a positive relationship with the probability of food processing participation, but a negative relationship with the intensity of processing.

District gross income per capita (GHS)($\boldsymbol{DD_{INC_{Gpc}}}$) is the ratio of the total district income to the total population in the district. Districts with high income per capita have a relatively large modern sector where traditional agriculture is not the primary occupation. In such communities, a substantial number of medium-scale agro-processing firms exist that provide opportunities for raw produce suppliers which may discourage household food processing (Andam et al., 2015; Kwaw et al., 2015). More generally, growth in the modern sector is characterised by the migration of labour to off-farm occupations (Lewis, 1954). On the other hand, growth in the urban sector could encourage farm-household processing activities as the market for processed goods might be better which lets us expect a positive relationship. Therefore, no clear hypothesis on the direction of the relationship between farm household food processing and district income per capita is formulated. To account for the inflationary effect the survey periods (GLSS 6 and GLSS7), district income per capita is deflated at the year 2017 consumer price index (CPI) value [CPI at 2010 base year values GLSS7(2017) =230.87 and GLSS6(2013) =130.06].

District urban households share (*URBANR*) refers to the proportion of the sampled households in areas considered to be urban in a district expressed as a percentage. Diao, Magalhaes and Silver, (2019a) find that many rural households close to urban areas in Ghana shift their primary employment from agriculture to non-agriculture, which contrasts with the traditional model of rural diversification. However, we argue that farm households closer to urban centres are more likely to participate and intensify food processing activities due to available market demand. It is expected that households in districts with high urban household shares will more likely to participate in and intensify farm household food processing.

District rural electrification share ($\boldsymbol{DD_{RUE}}$) is the proportion of the total number of rural households with electricity from the main national grid as a source of lighting in a district to the total number of rural households in that district as a percentage. In many instances electrification is used as a measure of development level (Akiki et al.,

2010) and access to electricity is one of the key determinants of rural household non-farm income (Senadza, 2012). Traditional farm household food processing usually does not depend on electric power, and the transition to the use of electricity for processing activities will require high capital investments in power supply and machinery. Therefore, we hypothesise that districts with a high rural electrification ratio have less participation and less intensity of farm household food processing.

Married household head($\boldsymbol{HH_{hMAR}}$**)** is a dummy variable that indicates whether a household has a married head or otherwise. A household is assigned the value of 1 if the head is married and 0 otherwise. The marital status of the household head is used as an identification/exclusion independent variable. Spouse utility functions are linked-up subject to budget constraints amid some degree of bargaining between spouses as further elaborated by Grossbard (1993). Marriage increases the expenditure of the new family especially when they give birth. Assuming rationality, the household head will seek out additional economic activity to augment the additional expenditure. Therefore a married farm household head will more likely encourage the spouse to engage in commercial food processing activities, but not the conditional expectation of the processing intensity (Sienso et al., 2015).

The Heckman model accounts for selection bias but other sources of endogeneity need a different approach (Certo et al., 2016). The two-stage least squares technique is applied to equations 1 and 2 as we expect our key variable of interest, the land constraint, (agricultural land per working household member) to be endogenous. Given the conceptual model above, the decision to process food on a farm is an alternative or complementary livelihood choice to primary agricultural production requiring the appropriation of farmland. Consequently, the land constraint measure may vary with the dependent variable in both equations. We choose the area of land owned by the household with a title ($Land_{qtitle}$), and per capita total farmland area in a district ($DDF1_{sizepc}$) as instruments as they are likely (positively) correlated with the household's land constraint. The idea is that households that have land with a title are better established in the land market and are therefore less likely to be land-constrained. We also expect districts with more land per person are less likely to be land constrained. A summary of the description of variables, including instruments used and the *a-priori* expectations on effects is in Table 5.3.

Table 5.3: Definition of variables used for econometric analysis

Symbol	Unit	Variable description	Expected signs:part/int*
Indep. Var.			
HH_P	Percent	(Number of working-age individuals who participated in processing to working-age individuals) *100	
Dep. Var.			
HH_{hMAR}	Binary	Married household head (= 1 if married; 0 otherwise)	+
$HH_{Land_{cs}}$	Ha per person	Agricultural land available per working-age household members	-/-
$lnHH_{asset}$	Ghana Cedis	Logged household assets value	+/+
$HH_{hGender}$	Binary	Gender of household head (=1 if male; 0 otherwise)	-/-
HH_{educ}	Years	The average educational level of household members	+/+
$HHdep_{ratio}$	Percent	(Number of non-working-age individuals to working-age individuals) *100	+/-
$DD_{INC_{Gpc}}$	Ghana Cedis	Gross district income per capita	+-/-+
$URBANR$	Percent	(Number of urban households in a district divided by the total number of households in the district) * 100	+/+
DD_{RUE}	Percent	(Number of rural households with electrification in district / total number of rural households in district) *100	+/+
Instrument			
$Land_{qtitle}$	Ha	The amount of land operated by households with title in hectares	+
$DDF1_{sizepc}$	Ha per person	Total land farmed in the district per total population of working-age people in a district	+

*part. = participation and int =intensity.

5.5.3 **Data source**

A pooled dataset consisting of two waves of the Ghana Living Standard Survey (GLSS), (GLSS 7 -2016/17) and (GLSS 6 -2012/13) was used. From the GLSS 7, a total of 7,233 farm households were identified after merging data sub-files and correcting for misspelt words, wrong coding, and outliers. A sub-total of 3,878 households have had at least one member active in the processing of an agricultural commodity. The remaining 3,355 households did not engage in processing. The GLSS 6 comprised 9,177 farm households of which 5,417 processed an agricultural commodity and 3,760 households did not. In all, a total of 120 districts are included in the analysis. Stata version 15 was used for data cleaning and data analyses (StataCorp., 2017).

5.5.4 **Comparisons between households participating and not participating in agro-food processing**

The mean of the variables is statistically different between the two categories of households (participating and non-participating in agro-food processing) except for gross district income per capita (Table 5.4). Compared to non-participating households, agro-food processing households have a larger proportion of married household heads, are more land constrained, and have more assets. Household heads in both categories were more likely to be males than females. Male-headed households have a larger share of food processing households. On average, non-participating households have roughly one year more of higher education and a lower dependency ratio. In terms of district variables, food processing households are in districts with higher gross income but non-participating farm households are located in districts with a comparatively higher average urbanisation and rural electrification rate. On average non-participating households have more titled land and are located in districts with more land per person. At least 26 percent of members in processing households are engaged in processing activities.

Table 5.4: Comparative summary statistics of variables used for the analysis

Variables	Participants (N=9295)		Non-Participants (N=7115)		Mean difference*
	Mean	sd	Mean	sd	
HH_{hMAR}	0.721	0.449	0.611	0.488	**0.110**
$HH_{Land_{cs}}$	0.795	2.626	1.354	9.913	**-0.558**
$lnHH_{asset}$	7.145	1.947	6.977	2.163	**0.168**
$HH_{hGender}$	0.792	0.406	0.755	0.430	**0.037**
HH_{educ}	4.594	3.424	6.099	4.130	**-1.506**
$HHdep_{ratio}$	0.560	0.779	0.417	0.725	**0.143**
$DD_{INC_{Gpc}}$	773.825	6281.944	726.723	4612.543	47.102
$URBANR$	14.059	14.927	18.952	18.764	**-4.894**
DD_{RUE}	38.919	26.390	49.427	28.057	**-10.509**
instruments					
$Land_{qtitle}$	0.852	9.391	1.259	12.102	**-0.408**
$DDF1_{sizepc}$	0.116	0.149	0.164	0.249	**-0.048**
Dep. Var.					
HH_P	26.580	20.910			

**Ha: diff != 0 ; Pr(|T| > |t|) = 0. The estimated mean differences are boldened if it's significantly different from zero.*

Source: Estimation from GLSS 6 and 7 (GSS, 2012/13, 2016/17)

5.6 Results and discussion

To make the estimated effects of all variables comparable, the standardised coefficients (a product of the estimated coefficient and the ratio of the standard deviation of "x" over the standard deviation of "y") are reported for the intensity model. To capture the importance of variables for the participation decision, the average marginal effects of the probit model are multiplied by the standard deviations of the respective variables. Reduced form estimates for the potentially endogenous land constraint variable revealed a positive correlation with the variable (see Appendix 1A for full estimated parameters).

The F-statistics testing for the joint hypothesis that the coefficients of the reduced form equation are all zero is 422.9. This is larger than the recommended value of 12 for a two-stage least square inference to be reliable (Stock et al., 2002). F-value is greater or equal to 12 and we reject the null hypothesis of weak instruments. A Durbin–Wu–Hausman test for the presence of endogeneity rejects the null hypothesis of no endogeneity (see Appendix 1B).

The estimated Heckman model is presented in Table 5.5 (the complete estimates can be found in Appendix 5.2). In all, important participation decision variables in order of magnitude in absolute terms of the product of marginal effect and standard deviation are the education level of the household members, district rural electrification share, land constraint, household asset value, household head's gender, married household head, the share of urban households in a district, and per capita income of a district. The extent of household participation in on-farm agro-processing in order of magnitude depends on household dependency ratio, household head gender, education level of household members, district rural electrification share, and per capita income of a district.

Table 5.5: Estimates of the Heckman selection model for farm household food processing activities in Ghana

	Participation Equation			Intensity equation (Labour share in agro-processing)	
Variables	**Porbit**	**ME**	**ME*SD**	**OLS**	**Beta Std.**
$HH_{Land_{cs}}$	**-0.040**	-0.012	-0.032	0.683	0.015
	(0.012)	(0.003)		(0.424)	
$lnHH_{asset}$	**0.057**	0.016	0.031	-0.173	-0.016
	(0.008)	(0.002)		(0.384)	
$HH_{hGender}$	**-0.189**	-0.054	-0.022	**-8.261**	-0.160
	(0.048)	(0.014)		(1.660)	
HH_{educ}	**-0.065**	-0.019	-0.065	**-0.960**	-0.157
	(0.005)	(0.002)		(0.291)	
$HHdep_{ratio}$	0.030	0.009	0.007	**-7.365**	-0.274
	(0.023)	(0.006)		(0.058)	
$DD_{INC_{Gpcd}}$	**-0.000**	0.000	0.000	**-0.028**	-0.020
	(0.000)	(0.000)		(0.006)	
$URBANR$	**0.004**	0.001	14.927	0.117	0.117
	(0.002)	(0.001)		(0.092)	
DD_{RUE}	**-0.008**	-0.002	26.390	**-0.109**	-0.138
	(0.001)	(0.000)		(0.058)	
HH_{hMAR}	**0.172**	0.049	0.022		
	(0.040)	(0.012)			
$insthat$	**0.283**	0.081		**1.863**	
	(0.036)	(0.010)		(1.126)	
$Constant$	0.142			16.954	
	(0.188)			(10.485)	
$SurveyDumm$	*Yes*			*Yes*	
$DistrictDumn$	*Yes*			*Yes*	
lambda					**46.302**
					(6.901)
Observations	14,843				14,843
Wald chi2(204)					520.860
Prob>chi2					0.000

Notes: Standard errors are in parentheses, Estimated coefficients are in bold if the 90% confidence interval does not include the value 0.

ME= marginal effect calculated as the average across all covariates in the probit model

Source: Own estimates

The results give fairly strong statistical support to the prior expectation that the likelihood to participate in food processing reduces with more agricultural land per working household members (15 years and above) ($HH_{Land_{cs}}$). However, the precision of the estimate does not give much evidence for the land constraint to also affect the intensity of processing, i.e., the level of engagement of household labour conditional on having decided to do food processing.

Concerning other household characteristics, the estimates support that the value of household assets ($lnHH_{asset}$) positively influence the likelihood of agricultural households' participation in food processing as expected. But the estimate does not show the same for the intensity of processing. The coefficient on 'Male farm household head' ($HH_{hGender}$) is negative in the participation equation over the 90% confidence interval which is consistent with our hypothesis and male-headed farm households show a lower probability of participation in food processing by almost 5 percentage points. Male household heads also reduce the share of labour contributed to food processing for the participating households by about 0.16 standard deviation.

Contrary to our hypothesis, the results showed a significant negative relationship between a household's average number of years of formal education of members (HH_educ) and the probability to participate in food processing as well as the extent of participation. A year increase in the education of household members decreases the probability of participation by 1.9 percentage points. Estimates further imply that the share of household members in food processing activities is reduced by about 0.16 standard deviation with a one standard deviation increase in a household's average education. This implies that farm households with a higher average level of education will allocate either labour to farm expansion or other non-farm sectors rather than agro-processing. The data does not support that the dependency ratio ($HHdep_{ratio}$) influences the probability of farm household participation in food processing but it does for a negative influence on processing intensity in line with our hypothesis. 'Married farm household head' (HH_{hMAR}) positively affects the probability of diversifying into food processing as expected. Marriage comes with additional expenditure and responsibility as well as the opportunity for the farming household which may be addressed by diversifying.

According to the results, gross district income per capita ($DD_{INC_{Gpc}}$) negatively relates to the probability of farm household participation in food processing and the extent of participation. One deviation change in a district's per capita income reduces the share of household members committed to food processing by about 0.02 standard deviation.

This result implies that a farm household in relatively wealthy districts is less likely to diversify into food processing. Also, farm households in food processing activities tend to reduce the share of household members in the food processing activities as the economy of the district grows and alternative employment opportunities arise.

Further, the share of urban households in a district ($URBANR$) positively influences the probability of farm households' participation in food processing. This result implies that farm households in relatively highly urbanised districts will likely favour diversifying into food processing. Given that we control for the usually strong farmland constraints in urban districts, the access to markets with high demand for processed food products is likely reflected in this result.

Finally, district rural electrification share negatively relates to the probability of farm household labour participation in food processing as well as the extent of labour participation. A one-standard-deviation increase in the share of rural households with electrification in a district reduces the extent of participation in food processing by about 0.14 standard deviations.

5.7 Summary and conclusion

In this study, the factors that influence farm household participation, as well as the share of household labour committed to food processing activities, are identified using two waves of nationally representative household living standard surveys (GLSS 6&7). After controlling for sample selection, sampling and district fixed effects, and endogenous bias, the result reveals that land-constrained and asset-rich farm households are likely to participate in food processing. Further, the likelihood of participation and its intensity is lower for male-headed households who are married. An increased year of education for farm household members reduces the likelihood of participating in food processing as well as its intensification. On regional development level factors, districts with higher income per capita, and a high share of rural households with electricity are associated with a lower probability of a farm household's diversification into food processing and a lower intensity for those engaging in food processing. A high share of urban households in a district increases the likelihood of farm household participation in food processing is likely related to the higher demand for processed food and thereby encouraging commercialisation.

This study supports the assertion that "surplus labour" from farm households that are constrained by land accessibility is more likely to diversify to food processing. As such, food processing is an important diversification and employment avenue for farm

labour that do not get employed in other non-farm sectors when the labour market constraints relax in the course of regional economic growth.

Further, the study implies that farm household food processing could be used as a short-term measure of employment and income diversification. However, its relevance could fade with economic development. Support to land-constrained farms, and female household heads by development practitioners to diversify into food processing will attract a positive response from the target group.

5.8 References

Abdul-Hakim, R., & Che-Mat, H., Siti. (2011). Determinants of Farmer's Participation in Off-Farm Employment: A Case Study in Kedah Darul Aman, Malaysia. *Asian Journal of Agriculture and Rural Development*, *01*(04), 1–12.

Ackah, C., & Medvedev, D. (2012). Internal migration in Ghana: Determinants and welfare impacts. *International Journal of Social Economics*, *39*(10), 764–784. https://doi.org/10.1108/03068291211253386

Acquaye, D., Dziedzoave, N., Wordey, M. T., Mills, J., & Nunoo, F., K. E. (2021). *Ghana Food Manufacturing Study: An Analysis of Ghana's Aquaculture, Fruits & Vegetable, and Poultry Processing Sectors*. Africa Insights Desk Publications. https://www.rvo.nl/sites/default/files/2021/05/Ghana-Food-Manufacturing-Study.pdf

Addaquaye, J. (2004). *Shea Butter Value Chain: Refining in West Africa.* (WATH Technical Report 3).

Afful-Koomson, T., William, F., Frimpong, S., & Amoh, N. (2015). *Economic and Financial Analyses of Small and Medium Food Crops Agro-Processing Firms in Ghana* (First). United Nations University Institute for Natural Resources in Africa (UNU-INRA).

Akaakohol, M. A., & Aye, G. C. (2014). Diversification and farm household welfare in Makurdi, Benue State, Nigeria. *Development Studies Research*, *1*(1), 168–175. https://doi.org/10.1080/21665095.2014.919232

Allen, T., Heinrigs, P., & Heo, I. (2018). *Agriculture, alimentation et emploi en Afrique de l'Ouest* (Notes ouest-africaines 14; Notes ouest-africaines, Vol. 14). https://doi.org/10.1787/56d463a9-fr

Andam, K., Al-Hassan, R. M., Asante, S. B., & Diao, X. (2015). Is Ghana making progress in agro-processing? *International Food Policy Research Institute, IFPRI, WORKING PAPER 41, December 2015*, 15.

Asmah, E. E. (2011). Rural livelihood diversification and agricultural household welfare in Ghana. *Journal of Development and Agricultural Economics*, *3*(7), 325–334.

Babatunde, O., & Qaim, M. (2009). Patterns of income diversification in rural Nigeria: Determinants and impacts. *Quarterly Journal of International Agriculture*, *48*(4), 305–320.

Bricas, N., & Broutin, C. (2008). Agri-food and trade micro-activities and poverty reduction in sub-Saharan Africa. In *Trade as a development tool: Partnerships and policies* (p. 21).

Certo, S. T., Busenbark, J. R., Woo, H., & Semadeni, M. (2016). Sample selection bias and Heckman models in strategic management research: Sample Selection Bias and Heckman Models. *Strategic Management Journal*, *37*(13), 2639–2657. https://doi.org/10.1002/smj.2475

Diao, X., Harttgen, K., & McMillan, M. (2017). The Changing Structure of Africa's Economies. *The World Bank Economic Review*, *31*(2), 412–433. https://doi.org/10.1093/wber/lhw070

Diao, X., Magalhaes, E., & Silver, J. (2019a). Cities and rural transformation: A spatial analysis of rural livelihoods in Ghana. *World Development*, *121*, 141–157. https://doi.org/10.1016/j.worlddev.2019.05.001

Diao, X., Magalhaes, E., & Silver, J. (2019b). Urbanization and its Impact on Ghana's Rural Transformation. In X. Diao, P. Hazell, S. Kolavalli, & D. Resnick (Eds.), *Urbanization and its Impact on Ghana's Rural Transformation* (pp. 121–141). Oxford University Press. https://oxford.universitypressscholarship.com/view/10.1093/oso/9780198845348.001.0001/oso-9780198845348-chapter-5

Eneyew, A. (2012). Determinants of Livelihood Diversification in Pastoral Societies of Southern Ethiopia. *Journal of Agriculture and Biodiversity Research*, *1*(3), 43–52.

Food and Agriculture Organization (FAO). (1997). The State of Food and Agriculture. In *The Agro-Processing Industry and Economic Development* (pp. 1–267). Food and Agriculture Organization of the United Nations (FAO). http://www.fao.org/3/a-w5800e.pdf

Food and Agriculture Organization (FAO). (2017). *Farm size | Family Farming Knowledge Platform | Food and Agriculture Organization of the United Nations*. Family Farming Knowledge Platform. http://www.fao.org/family-farming/data-sources/dataportrait/farm-size/en/

Grossbard, S. (1993). *A Theory of Marriage, Labor, and Divorce* (Second). Springer Publishing.

Guirkinger, C., & Platteau, J.-P. (2014). The Effect of Land Scarcity on Farm Structure: Empirical Evidence from Mali. *Economic Development and Cultural Change*, *62*(2), 195–238. https://doi.org/10.1086/674340

Habiyaremye, A., & Mupela, E. (2019). How effective is local beneficiation policy in enhancing rural income and employment? The case of agro-processing beneficiation in Tzaneen, South Africa. *Local Economy*, *34*(4), 329–345. https://doi.org/10.1177/0269094219857037

Harris, J. R., & Todaro, M. P. (1970). Migration, Unemployment and Development: A Two-Sector Analysis. *The American Economic Review*, *60*(1), 126–142.

Headey, D., Dereje, M., & Taffesse, A. S. (2014). Land constraints and agricultural intensification in Ethiopia: A village-level analysis of high-potential areas. *Food Policy*, *48*, 129–141. https://doi.org/10.1016/j.foodpol.2014.01.008

Headey, D., & Jayne, T. S. (2014). Adaptation to land constraints: Is Africa different? *Food Policy*, *48*, 18–33. https://doi.org/10.1016/j.foodpol.2014.05.005

Heckman, J. J. (1979). Sample Selection Bias as a Specification Error. *Econometrica*, *47*(1), 153–161. https://doi.org/10.2307/1912352

Islam, N., & Yokota, K. (2008). Lewis Growth Model and China's Industrialization. *Asian Economic Journal*, *22*(4), 359–396. https://doi.org/10.1111/j.1467-8381.2008.00282.x

Jayne, T. S., Benfica, R., Yeboah, F. K., & Chamberlin, J. (2019). Agricultural Transformation and Africa's Economic Development. In E. Nnadozie & A.

Jerome (Eds.), *African Economic Development* (pp. 349–375). Emerald Publishing Limited. https://doi.org/10.1108/978-1-78743-783-820192018

Key, N., Sadoulet, E., & de Janvry, A. (2000). Transactions Costs and Agricultural Household Supply Response. *American Journal of Agricultural Economics*, *82*(2), 245–259. https://doi.org/10.1111/0002-9092.00022

Khatun, D., & Roy, B. C. (2012). Rural Livelihood Diversification in West Bengal: Determinants and Constraints. *Agricultural Economics Research Review*, *25*(1), 115–124.

Khoza, T. M., Senyolo, G. M., Mmbengwa, V. M., & Soundy, P. (2019). Socio-economic factors influencing smallholder farmers' decision to participate in agro-processing industry in Gauteng province, South Africa. *Cogent Social Sciences*, *5*(1), 1664193. https://doi.org/10.1080/23311886.2019.1664193

Kindness, H., & Gordon, A. (2001). *Agricultural marketing in developing countries: The role of NGOs and CBOs*. Natural Resources Institute. http://r4d.dfid.gov.uk/PDF/Outputs/R7941002.pdf

Kpossilande, C. E., Honfoga, B. G., & Ferre, T. (2020). Economic potentials of artisanal food processing microenterprises in West Africa: Case of "atta" production in Cotonou (Benin). *Agricultural and Food Economics*, *8*(1), 24. https://doi.org/10.1186/s40100-020-00168-y

Kuwornu, J. K. M., Bashiru, M., & Dumayiri, M. (2014). Farm Households' Livelihood Diversification into Agro-processing and Non-agro- processing Activities: Empirical Evidence from Ghana. *Information Management and Business Review*, *6*(4), 191–199.

Kwaw, A., M, A.-H., Ramatu, Boamah, A., Seth, & Xinshen, D. (2015). *Is Ghana making progress in agro-processing?: Evidence from an inventory of processed food products in retail shops in Accra*. Intl Food Policy Res Inst.

Lambrecht, I., & Asare, S. (2016). The complexity of local tenure systems: A smallholders' perspective on tenure in Ghana. *Land Use Policy*, *58*, 251–263. https://doi.org/10.1016/j.landusepol.2016.07.029

Leung, S. F., & Yu, S. (1996). On the choice between sample selection and two-part models. *Journal of Econometrics*, *72*(1), 197–229. https://doi.org/10.1016/0304-4076(94)01720-4

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *The Manchester School of Economics*, *22*(2), 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

Mayer, E., & Glave, M. (2008). Alguito para ganar(a little something to earn): Profits and losses in peasant economies. *American Ethnologist*, *26*(2), 344–369. https://doi.org/10.1525/ae.1999.26.2.344

Ministry of Food and Agriculture (MoFA). (2015). *Medium Term Agricultural Sector Investment Plan (METASIP) II, 2014 – 2017*. MOFA. http://mofa.gov.gh/site/wp-content/uploads/2016/10/METASIP-II.pdf

Ministry of Food and Agriculture (MoFA). (2018). *Medium Term Expenditure Framework (MTEF) (2018-2021)*. MOFA. https://www.mofep.gov.gh/sites/default/files/pbb-estimates/2018/2018-PBB-MoFA.pdf

Ministry of Food and Agriculture (MoFA). (2019). *Medium Term Expenditure Framework (MTEF) FOR 2019-2022*. Republic of Ghana. https://www.mofep.gov.gh/sites/default/files/pbb-estimates/2019/2019-PBB-MoFA.pdf

Morris, M. L., Tripp, R., & Dankyi, A. A. (1999). *Adoption and Impacts of Improved Maize Production Technology: A Case Study of the Ghana Grains Development Project* (99–01; Economics Program Paper 99-01, pp. 201–202). International Maize and Wheat Improvement Center (CIMMYT). http://link.springer.com/10.1007/BF02772888

Mthombeni, D., Antwi, M. A., Rubhara, T., & University of South Africa, Florida, Johannesburg, South Africa. (2021). Level of Participation of Small-Scale Crop Farmers in Agro-Processing in Gauteng Province of South Africa. *The African Journal of Food, Agriculture, Nutrition and Development*, *21*`(01), 17125–17139. https://doi.org/10.18697/ajfand.96.19455

Nicholson, W., & Snyder, C. (2012). *Microeconomic Theory Basic Principles and Extensions* (11th ed.). South-Western Cengage Learning. https://edisciplinas.usp.br/pluginfile.php/4471658/mod_folder/intro/NI_11th%20Edtion%20%281%29.pdf

Olale, E., & Henson, S. (2012). Determinants of income diversification among fishing communities in Western Kenya. *Fisheries Research*, *125–126*, 235–242. https://doi.org/10.1016/j.fishres.2012.02.029

Owoo, N. S., & Lambon-Quayefio, M. P. (2018). The Agro-Processing Industry and its Potential for Structural Transformation of the Ghanaian Economy. In R. Newfarmer, J. Page, & F. Tarp (Eds.), *Industries without Smokestacks:*

Industrialization in Africa Reconsidered (pp. 1–23). Oxford University Press. https://www.oxfordscholarship.com/view/10.1093/oso/9780198821885.001.0001/oso-9780198821885

Quartey, E., & Darkwah, S. (2015). Factors affecting the use of modern technologies in Agro processing in Ghana. *Academia Journal of Agricultural Research*, *3*(7), 99–115. https://doi.org/DOI: 10.15413/ajar.2015.0135

Quartey, E. T., & Darkwah, S. (2015). Factors affecting the use of modern technologies in agro processing in Ghana. *Academia Journal of Agricultural Research*, *3*(7), 99–115.

Reardon, T. (2015). The hidden middle: The quiet revolution in the midstream of agrifood value chains in developing countries. *Oxford Review of Economic Policy*, *31*(1), 45–63. https://doi.org/10.1093/oxrep/grv011

Rodrik, D. (2018). An African Growth Miracle? *Journal of African Economies*, *27*(1), 10–27. https://doi.org/10.1093/jae/ejw027

Sadoulet, E., & de Janvry, A. (1995). *Quantitative Development Policy Analysis.* The Johns Hopkins University Press. https://ideas.repec.org/a/oup/ajagec/v78y1996i1p251-253.html

Saha, B., & Bahal, R. (2010). Livelihood diversification pursued by farmers in West Bengal. *Indian Research Journal of Extension Education*, *10*(2), 1–9.

Scherrer, C. (2018). Labour surplus is here to stay: Why 'decent work for all' will remain elusive. *Journal of Social and Economic Development*, *20*(2), 293–307. https://doi.org/10.1007/s40847-018-0066-2

Schwiebert, J. (2015). Estimation and interpretation of a Heckman selection model with endogenous covariates. *Empirical Economics*, *49*(2), 675–703. https://doi.org/10.1007/s00181-014-0881-z

Scully, B., & Britwum, A. O. (2019). Labour reserves and surplus populations: Northern Ghana and the Eastern Cape of South Africa. *Journal of Agrarian Change*, *19*(3), 407–426. https://doi.org/10.1111/joac.12309

Senadza, B. (2012). Non-farm Income Diversification in Rural Ghana: Patterns and Determinants. *African Development Review*, *24*(3), 233–244. https://doi.org/10.1111/j.1467-8268.2012.00322.x

Sienso, G., Mabe, F., & Mbeah, J. (2015). Factors Influencing Participation of Crop Farming Households in Non-farm Activities in Ghana. *Asian Journal of Agricultural Extension, Economics & Sociology*, *6*(3), 117–125. https://doi.org/10.9734/AJAEES/2015/15814

Staatz, J., & Holliger, F. (2016). *West African Food Systems and Changing Consumer Demands* (West African Papers 4; West African Papers, Vol. 4). OECD Publishing. https://doi.org/10.1787/b165522b-en

Statistics, Research and Information Directorate (SRID). (2016). *Agriculture in Ghana: Facts and Figures (2015)*. MOFA. https://www.agrofood-westafrica.com/fileadmin/user_upload/messen/agrofood-Westafrica/Brochure/AGRICULTURE-IN-GHANA-Facts-and-Figures-2015.pdf

Stock, J. H., Wright, J. H., & Yogo, M. (2002). A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments. *Journal of Business*

& Economic Statistics, *20*(4), 518–529. https://doi.org/10.1198/073500102288618658

Thindisa, L. M. V., & Urban, B. (2018). Human–social capital and market access factors influencing agro-processing participation by small-scale agripreneurs: The moderating effects of transaction costs. *Acta Commercii*, *18*(1), 1–10. https://doi.org/10.4102/ac.v18i1.500

Wang, X., & Weaver, N. (2013). Surplus labour and Lewis turning points in China. *Journal of Chinese Economic and Business Studies*, *11*(1), 1–12. https://doi.org/10.1080/14765284.2012.755303

Wiggins, S., & Keats, S. (2013). *Leaping & Learning: Linking Smallholders to markets* (p. 120). https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8401.pdf

World Bank. (2020, June 20). *World Development Indicators | DataBank*. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators

Xu, X., Wong, S. C., Zhu, F., Pei, X., Huang, H., & Liu, Y. (2017). A Heckman selection model for the safety analysis of signalized intersections. *PLoS ONE*, *12*(7), 1–16.

5.9 Appendix 5.1A: Full instrumented estimates

Source	SS	df	MS	Num of obs	=	14,843
				F(19, 14823)	=	442.49
Model	235308.926	19	12384.6803	Prob > F	=	0.0000
Residual	414873.828	14,823	27.9885197	R-squared	=	0.3619
				Adj R-sqd	=	0.3611
Total	650182.754	14,842	43.8069502	Root MSE	=	5.2904

HH_Land_cs	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95% Conf.**	**Interval]**
Land_qtitle	0.056	0.007	8.630	0.000	0.044	0.069
DDF1_sizepc	5.061	0.738	6.860	0.000	3.615	6.507
lnHH_asset	0.014	0.030	0.480	0.633	-0.044	0.072
HH_hGender	0.269	0.152	1.770	0.077	-0.029	0.566
HH_educ	0.008	0.018	0.430	0.664	-0.028	0.044
HHdep_ratio	0.000	0.001	0.610	0.545	-0.001	0.002
DD_INC_Gpcd	0.005	0.060	0.090	0.932	-0.113	0.123
URBANR	0.000	0.004	-0.020	0.984	-0.007	0.007
DD_RUE	-0.002	0.002	-0.640	0.522	-0.006	0.003
r7Land_qtitle	0.398	0.008	46.880	0.000	0.382	0.415
r7DDF1_sizepc	-4.513	0.780	-5.790	0.000	-6.042	-2.985
r7lnHH_asset	-0.023	0.045	-0.520	0.603	-0.111	0.065
r7HH_hGender	0.121	0.223	0.540	0.586	-0.315	0.557
r7HH_educ	0.102	0.027	3.710	0.000	0.048	0.156
r7HHdep_ratio	0.093	0.080	1.160	0.245	-0.064	0.249
r7DD_INC_Gpcd	-0.005	0.060	-0.080	0.935	-0.123	0.113
r7URBANR	0.001	0.006	0.130	0.894	-0.011	0.013
r7DD_RUE	-0.001	0.004	-0.200	0.840	-0.008	0.006
r7	-0.007	0.422	-0.020	0.988	-0.833	0.820
_cons	-0.187	0.277	-0.680	0.499	-0.731	0.356

5.10 **Appendix 5.1B: Test of endogeneity**

****test for edogeneity

. quietly reg $inst

. quietly predict e, resid

. quietly reg $ylist $xlist e

. test e

(1) e = 0

F(1, 8541) = 67.79

Prob >F = 0.0000

5.11 Appendix 5.2: Full instrumented Heckman model estimates

```
. heckman $ylist $xlist insthat r7insthat, select(dy=$xdlist insthat r7insthat) two-step
note: two-step estimate of rho = 1.3338317 is being truncated to 1
Heckman selection model -- two-step estimates     Number
of obs                                          =      14,843
(regression model with sample selection)        Selected =      8,560

Nonselected                                     =      6,283

Wald chi2(18)                                   =      520.86
Prob > chi2                                     =      0.000
```

a. OLS

HH_P	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
HH_Land_cs	0.683	0.424	1.610	0.107	-0.148	1.514
lnHH_asset	-0.173	0.384	-0.450	0.653	-0.926	0.580
HH_hGender	-8.261	1.660	-4.980	0.000	-11.514	-5.008
HH_educ	-0.960	0.291	-3.300	0.001	-1.530	-0.389
HHdep_ratio	-0.074	0.008	-9.170	0.000	-0.089	-0.058
DD_INC_Gpcd	-0.028	0.006	-4.890	0.000	-0.039	-0.017
URBANR	0.117	0.092	1.270	0.204	-0.063	0.297
DD_RUE	-0.109	0.058	-1.880	0.060	-0.223	0.005
r7HH_Land_cs	1.065	0.609	1.750	0.080	-0.127	2.258
r7lnHH_asset	-0.100	0.504	-0.200	0.843	-1.087	0.887
r7HH_hGender	-0.435	2.402	-0.180	0.856	-5.142	4.272
r7HH_educ	1.546	0.331	4.670	0.000	0.897	2.195
r7HHdep_ratio	-4.772	0.869	-5.490	0.000	-6.476	-3.069
r7DD_INC_Gpcd	0.028	0.006	4.890	0.000	0.017	0.039
r7URBANR	-0.192	0.090	-2.130	0.033	-0.368	-0.015
r7DD_RUE	0.008	0.055	0.150	0.880	-0.100	0.116
r7	-10.862	4.846	-2.240	0.025	-20.360	-1.365
insthat	1.863	1.126	1.650	0.098	-0.345	4.070
r7insthat	-3.859	1.181	-3.270	0.001	-6.173	-1.545

b. Probit model

dy	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
HH_Land_cs	-0.040	0.012	-3.380	0.001	-0.064	-0.017
lnHH_asset	0.057	0.008	6.720	0.000	0.040	0.073
HH_hGender	-0.189	0.048	-3.970	0.000	-0.282	-0.096
HH_educ	-0.065	0.005	-12.160	0.000	-0.075	-0.054
HHdep_ratio	0.000	0.000	1.380	0.166	0.000	0.001
DD_INC_Gpcd	0.000	0.000	-4.430	0.000	-0.001	0.000
URBANR	0.004	0.002	2.260	0.024	0.001	0.008
DD_RUE	-0.008	0.001	-6.960	0.000	-0.011	-0.006
HH_hMAR	0.172	0.040	4.240	0.000	0.092	0.251
r7HH_hMAR	0.006	0.061	0.100	0.922	-0.114	0.126
r7HH_Land_cs	0.021	0.015	1.360	0.173	-0.009	0.050
r7lnHH_asset	0.003	0.013	0.250	0.800	-0.022	0.028
r7HH_hGender	-0.006	0.069	-0.090	0.929	-0.142	0.130
r7HH_educ	0.043	0.008	5.550	0.000	0.028	0.058
r7HHdep_ratio	0.063	0.022	2.940	0.003	0.021	0.105
r7DD_INC_Gpcd	0.000	0.000	4.380	0.000	0.000	0.001
r7URBANR	-0.004	0.002	-1.990	0.046	-0.008	0.000
r7DD_RUE	0.002	0.001	1.190	0.233	-0.001	0.004
r7	-0.345	0.118	-2.910	0.004	-0.577	-0.113
insthat	0.283	0.036	7.750	0.000	0.211	0.354
r7insthat	-0.266	0.037	-7.120	0.000	-0.339	-0.193
i.REGDIST	*inclusive*					
_cons	0.142	0.188	0.760	0.448	-0.225	0.510
/mills lambda	46.302	6.901	6.710	0.000	32.776	59.827
rho	1.000					
sigma	46.302					