THESIS / THÈSE

ADVANCED MASTER IN INTERNATIONAL AND DEVELOPMENT ECONOMICS

Role and determinants of structural transformation in Benin

Hounguevou, Yves

Award date:
2021

Awarding institution:
University of Namur

Link to publication

Role and determinants of structural transformation in Benin.

Thesis presented by
Yves HOUNGUEVOU

Supervisor(s)
Professor Romain HOUSSA (UCL/UNamur)

Tutor(s)
Doctor Modeste DAYE (UCL/UNamur)

Academic year 2020-21
July 31, 2021

Project presented as part of the requirements for the award of the Specialized Master in International and Development Economics Jointly organized by the ESLN and the ESL

Acknowledgement

Our sincere thanks to all the management staff (academic and administrative at UNamur). In particular, we address our thanks :

♣ to Professor Romain HOUSSA for his knowledge and tireless willingness in the writing of this document ;

♣ we address our thanks to Doctor. Modeste DAYE for his follow-up and advice in improving the work and

♣ to Mrs. Pierrette Noel for her humility and availability without forgetting the classmates in particular Thembi, Juliette, David and Dieu-Merci.

Contents

List of Tables

List of Figures

Abstract

This paper assesses the role and determinants of structural transformation in Benin over the period from 2001 to 2019. A comparative analysis between Benin and seven over countries in West Africa is provided. Using the Shapley decomposition method, the results show that, apart from Togo, where structural transformation has regressed economic growth, all the countries in the region have experienced positive structural transformation, with Côte d'Ivoire in the lead, followed by Benin and Niger. The static structural transformation was much more stimulating for growth in all these countries, although it was partially offset by a dynamic loss in Mali. A dynamic panel model reveals that the share of agriculture in employment, the share of commodities in exports, and the change in trade openness are positively and significantly correlated with structural change. In contrast, static structural change is negatively affected by agriculture's share of employment and the share of commodities in exports. It is, however, positively correlated with trade openness and the level of institutional management in these countries. The structural transformation observed in Benin contrasts sharply with that of Asian countries, since in WAEMU countries the majority of workers who leave the agricultural sector move to low-productivity sectors such as trade and transport.

Keywords: structural transformation; employment; within; static; dynamic; Benin; WAEMU.

Chapter 1

Introduction

The structural transformation of an economy is both a "cause and effect" concept of economic growth according to Timmer (2009). Indeed, economic expansion and structural change in a country are the result of a process of transformation and construction that positively affects economic output. Economic development is likely to be affected by the long-term processes of structural change that accompany economic growth. This reason led Kuznets and Murphy (1966) to believe that modern economic growth is a process of industrialization, urbanization and agricultural transformation that leads to economic welfare. Therefore, structural transformation appears to be a non-negotiable process for any country that aspires to an emerging economy. In simple terms, structural transformation is the reallocation or shift of factors of production in economic activities from less productive to more productive sectors (Boughton et al., 1994). For example, both sectors (agriculture and services) use labor and capital. However, the agricultural sector is generally more labor intensive than the industrial sector. Under normal circumstances, the agricultural sector should be more profitable than the other sectors, because there is more labor in agriculture in comparison to other sectors such as industry and services. Unfortunately, the distribution of the output of the agricultural sector over its workers is much lower than that of the industrial and service sectors. The literature indicates that agriculture has low productivity, while industry has higher productivity than agriculture. The structural transformation makes consequent shifts that increase the labor productivity of the beneficiary sector and, through this channel, improves the well-being of workers by increasing the wages of this sector. In light of this definition, we retain that most high economic growth countries are those that have generally undergone substantial and

favorable structural transformation according to McMillan and Rodrik (2014).

The process of structural transformation typically contains two key elements, namely: (i) the emergence of new productive activities and (ii) the movement of factors of production. Already in contemporary economies, some authors, namely Clark et al. (1967), Chenery (1960), Kuznets and Murphy (1966), Syrquin (1988), have succinctly addressed different aspects of structural transformation. These authors argue on the importance of economic and social institutions that lead to structural transformation. The important parts are the transmission channels through which the implications of structural transformation are conveyed. Structural transformation is a widespread issue in the eight countries of the West African Economic and Monetary Union (WAEMU). These countries are: Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo; all use the same currency (CFA) and have similar economic structures. Questions about the evolution of the economic structure of WAEMU countries are becoming increasingly frequent (Wane, 2004). This study assesses in greater depth the structural change in the various economic sectors (agriculture, manufacturing, construction, trade, services and transport) on labor productivity in Benin. On the other hand, it makes a comparative study with all WAEMU countries with aggregate data for the three main economic sectors (agriculture, industry and services). The observation of movements over time and space in productivity and employment in the three main sectors of WAEMU attests to the relevance of case studies on structural transformation (see Figures 2 and 3). Like the WAEMU countries, the issue of structural transformation in Benin has struggled for several years as it falls short from attaining the expected objectives. This is a reason why (Igue, 2019) believes that "rethinking Benin's economic development strategy is of paramount importance". For this author, Benin's economic growth has not yet entered the country's development path. He notes that Benin's economic growth is low compared to that of Asian countries that have clearly implemented the structural transformation necessary to strengthen their productivity. Thus, a key question arises: why doesn't the structural transformation of Benin's economic system involve high economic and dynamic productivity? The main question posed above will lead to two specific questions, namely:

1- *What is the role of structural transformation in labor productivity in Benin ?*
2- *What are the explanatory factors of structural transformation in WAEMU countries ?*
According to Bourdet (2002), the political and economic history of WAEMU countries dates back to the late 1980s, with the new era of financial and economic liberalization that

marked a new upswing in social life in several developing countries. The various political regimes in WAEMU countries have opted for economic growth and the well-being of the population. In one way or another, the economic policies of these countries have made efforts and implemented several strategies to combat poverty. This can be seen in the job creation actions for the management of the administration, for education at all levels, for the improvement of health centers, for the strengthening of industrial zones, etc. However, the evolution of economic growth in these countries continues to encounter certain obstacles, namely efficient management of the labor force, underemployment, unemployment, and many others. Transformation policy has varied over time as there have been changes in government in some countries. Although transformation policy's objectives appear similar, the implementation of such a policy differs from government to government and from country to country.

This study is important because in the economic literature, very few studies have focused on structural transformation in Benin. Also, structural transformation has become a tool for economic take-off because of its importance in economic restructuring. In Haile's (2018) comparative study, covering the period from 2005 to 2016, the author's results may not reflect the true aspects of Benin's structural transformation obstacle due to the short time period analyzed. Apart from the decomposition-based structural transformation model, this work did not identify the factors that explain Benin's structural change. The contribution of our study will be to push the research barrier, explaining through some models, the aspects that remained unaddressed in the literature. Moreover, the study period will be extended to assess the policy efforts of each government that has led the country since the 2000s. This will allow to see the effectiveness of each economic policy over the last two decades in Benin. In doing so, we start from the global aspect (WAEMU countries) to clearly examine the specific aspect (Benin).

During the 21st Intergovernmental Session of States of the Economic Commission for Africa (ECA) in Cotonou on June 28, 2018, Benin received a document entitled "Country Profile" for its new structural and economic orientation Azonwadé et al. (2018). It justifies the importance of the new political orientations taken by the current government. For Dimitri Sanga, Director of the West Africa office of the Economic Commission, African countries must turn to structural transformation of their economies. He goes on to give as the fundamental reason for the production of goods and the creation of more jobs for the thousands of underemployed and unemployed young people in the country. The

convergence of workers towards the industrial and tertiary sectors, and the reduction of the workforce in the agricultural sector. All these reasons constitute the motivations that stimulate attachment to this theme on the structural transformation of Benin.

This work on structural change reviews the economic functioning of WAEMU countries with a particular focus on Benin. Thus, structural change is assessed through the three main economic sectors (agriculture, industry and services). The particularity of Benin captures the contributions of the different sub-sectors of the economy to labor productivity. Indeed, a structural decomposition method has made it possible to calculate the value of structural change in sub-periods over the 19 years (2001-2019). With the WDI (2020) data, the structural transformation is explained by a series of explanatory variables through the random effect model estimation method. It is found that the share of agriculture in employment, the share of commodities in exports and the change in trade openness positively and significantly affect the structural change within. While the static change is negatively correlated with the share of agriculture in employment and the share of raw materials in exports positively correlated with the change in trade openness.

Chapter 2

Background: labor productivity and employment

2.1 Labor productivity and employment in Benin

Located in West Africa, Benin has a population of approximately 12 million, according to estimates by the national institute of statistics and economics in 2020. First, faced with a very rapid demography, the Beninese economy struggles to adapt structural change to its social and economic context. The accumulation of labor in the agricultural sector is an example of a real mis-adaptation of structural transformation in the Beninese context despite its various socio-political and geographical assets. Its economic policy related to structural transformation is still problematic due to its demographic configuration. With 121 kilometers of coastline along the Gulf of Guinea, its geographic location should allow it to develop several economic activities, such as the industry and services. However, the country has not yet begun the process of developing its key sectors of the economy and the consequences are clearly visible. The poverty rate continues to be high (see table n°1), chronic unemployment and famine are combined with a non-negligible illiteracy rate[1], etc. Comparing three countries, Haile (2018) finds that Benin's economy is mainly informal with a high level of poverty. The author makes it clear that the three West African countries namely Benin, Burkina-Faso and Côte d'Ivoire (BBC) have different levels of

---

[1]World Bank. (2020, 12 16). AFRICA CAN. Récupéré sur www.banquemondiale.org: https://www.banquemondiale.org/fr/country/benin/overview

Table 1 Comparison of the poverty level between three West African countries.

Year 2016	Benin	Burkina-Faso	Côte d'Ivoire
Poverty rate	51%	44%	35%
Informal sector	90%	80%	80%

Source: Haile (2018)

poverty and extent of informal sectors. These data are presented in the following Table 1.

Policy efforts over the past two decades have led Benin to maintain its stable economy according to this study by Haile (2018). Averaging 1.5%, the low growth rate per capita from 2008 to 2018 explains the level of poverty that remains widespread. Even though the poverty rate declined slightly from 40.1% to 38.2% between 2015 and 2020, the decline is still very small[2]. The country's development strategies and its strengths in terms of governance and institutional capacities are all factors that are favorable to the development of the Beninese economy. Economic development sectors such as agriculture (whose main product is cotton), trade, manufacturing and service activities in general have a significant share in economic growth. When looking at figure 1, we see that at a given level of labor input, output peaks and then falls. This means that labor input really must undergo an effective reorientation in sectors with high output. Otherwise, structural transformation will be useless for economic growth. This leads us to a problem in the Beninese context: what are the roles and determinants of the structural transformation necessary for the growth of the Beninese economy? Benin's predominantly three-sector economy in which the primary sector employs most of the workers comprising for barely one third of the Gross Domestic Product (GDP).

Before getting to the heart of the matter, looking at Figure 2 below, which shows the evolution of GDP per capita, there has been a noticeable effort, especially since 2005. Towards 2008, despite typical governmental problems detected in African countries, when the slight drop was observed, the general assumption might have been that this slight drop was linked to the financial crisis of 2008. Between 2015 and 2016, it was a period

---

[2]World Bank. (2020, 12 16). AFRICA CAN. Récupéré sur www.banquemondiale.org: https://www.banquemondiale.org/fr/country/benin/overview

Table 2 GDP and Population growth rates in Benin.

	Growth rate of population (%)	Growth rate of GDP (%)
2018	2.77	6.7
2019	2.75	6.9
2020	2.73	2.3

Source: Group of ADB and Worldometer (2020)

of change in political power in Benin. Clearly, the last two regimes have contributed to the economic growth of Benin, if we may say so. Benin's demographics and GDP growth rate[3] had a favorable relationship before the advent of Covid 19. The following table shows the evolution of these two variables over the past three years[4].

A good policy for economic growth seemed to fulfill Benin's expectations until 2019 when the Covid-19 pandemic reversed the trend. A considerable drop in economic growth was observed within a year. The country's real GDP growth rate slowed down from 6.9% in 2019 to 2.3% in 2020 from 6.7% in 2018. This decline in the growth rate on the supply side implies the underperformance of the sectors of agriculture, trade, transportation, and hotels and restaurants, sectors most affected by the health situation. On the other hand, demand is linked to the reduction in investment and private consumption. It should also be noted that inflation rose from -0.9% in 2019 to 2% in 2020, mainly due to the increase in the price of consumables. The advent of Covid-19 has also led Benin to experience a decline in tax revenues. By 2020, while the country's revenues declined by 6.5%, government expenditures were increased by 14.3%. Economic activities declined followed by increased health and social spending to combat the pandemic.

Benin's GDP per capita has been on an upward trend over the past two decades. Looking closely at figure 1, the slope of GDP per capita has been steeper over the last two quinquennia, which seems to restore Benin's status as a middle-income country. The following table provides information on the percentages of these three fundamental sectors of Benin's economy.

Compared to some countries that have undergone the same scenario to strongly trigger

---

[3]Perspectives économiques au Bénin — Banque africaine de développement - Bâtir aujourd'hui, une meilleure Afrique demain (afdb.org)

[4]https:// Benin Population (2021) - Worldometer (worldometers.info)

Figure 1: GDP per capita in Benin.
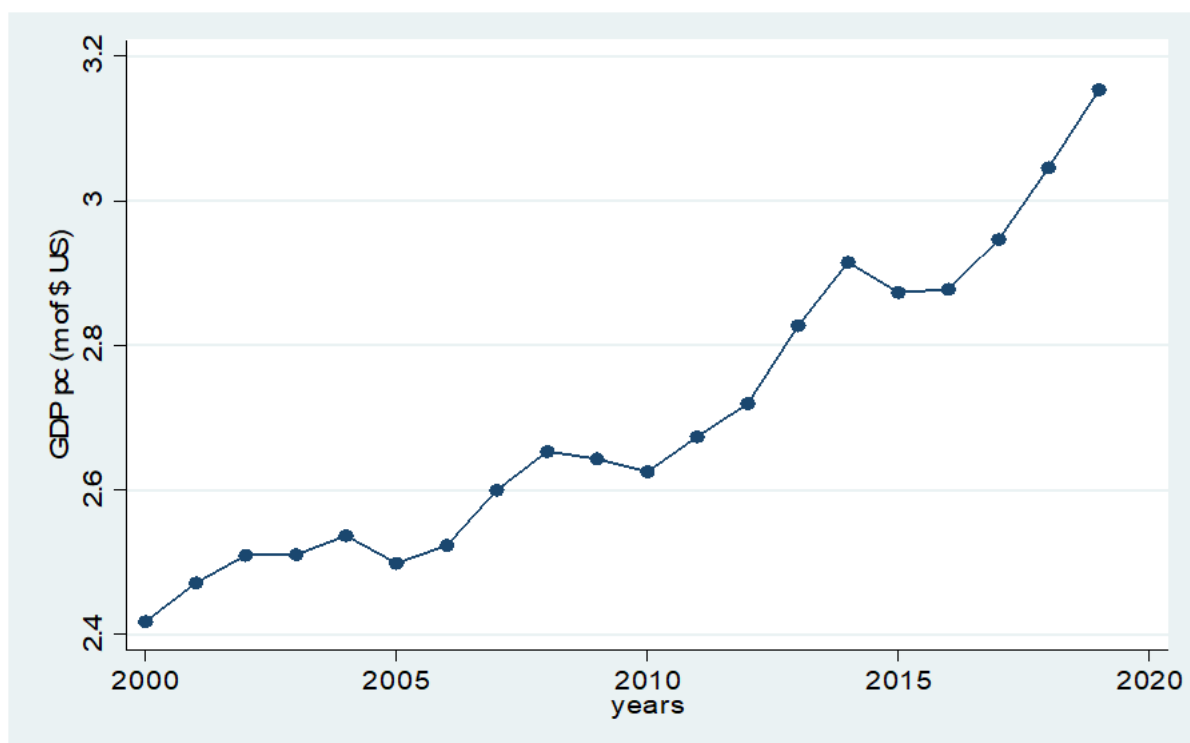
the growth of their economy, the exploratory mechanism of structural transformation in Benin is still very ambiguous. Indonesia is an Asian country which experienced a similar economic fate as Benin a few years ago. However, through a mechanism of changing its economic structure, it managed to improve its economy and became the world's sixteenth largest economy in 2018. The position that Indonesia occupied in 2018, is the result of a better reallocation of production factors to the most productive sectors between 2008 and 2017. Indonesia has experienced exceptional growth for the past ten years with an average rate of 5.3% per year. In addition to this exceptional growth, Indonesia's GDP per capita has tripled over a 20-year period (Manning, 2000). The comparison between Benin and Indonesia will help to understand the obstacles related to Benin's structural transformation.

The major difference between these two countries in adapting to structural change is the way in which the workforce has been reoriented. While Indonesia shifts its surplus labor to industries, Benin's labor is shifting to trade, which is also a low-productivity sector. Also, like China, there is a large gap that can be observed in a 30-year time span. Indeed, around 1994, the GDP per capita of China and Benin was almost at the same level (see

Table 3 The different economic sectors of Benin in the GDP.

Benin	Primary sector	Secondary sector	Tertiary sector
GDP	33%	13%	54%
Economic Sectors	- Rice and animal protein (for local consumption in general); - The cotton; - pineapple - cashew nuts - cassava	- Food industry; - Textile industry; - Cement production; - etc.	- Transportation; - Financial sector; - Trade; - Communication; - Tourism; - etc.

Source: DGAE/Benin (2019)

Figure 2: GDP per worker of some countries with Benin.
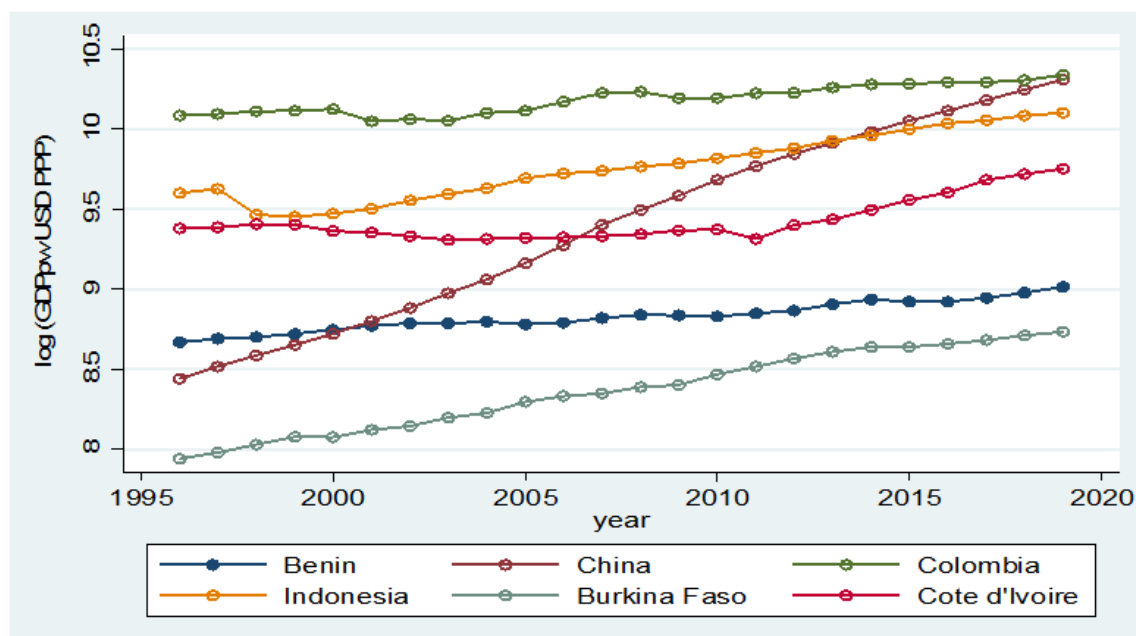
figure 2) but Benin's GDP per capita is struggling to grow.

In comparison with other countries, even from the WAEMU zone, Benin's GDP per capita is growing less than other countries. This shows a narrowing of the gap between Benin and Burkina Faso and a widening of the gap between the latter and the countries above it (China, Colombia, Cote d'Ivoire and Indonesia).

Haile (2018) findings showed that Benin experienced economic growth almost entirely due to static structural change between 2006 and 2015. The author finds in his research that there was a real effort of structural change in Benin, but labor migration was the real obstacle for its economic growth. Thus, low-productivity sectors such as trade have absorbed the majority of workers who have left the agricultural sector. The main objective

for the policy is to effectively manage these multiple workers who migrate to other less productive sectors. This is what leads Igue (2019) to call the productivity of structural transformation "the Beninese paradox." Indeed, the autor explains that the contribution of intra-sectoral reallocation of employment to the observed variation in aggregate productivity is almost absent in Benin. The other important thing to understand is that due to thousands of young graduates, the number of unemployed people already in the Beninese labor market increase every year. This large number of young people is added to the migrant workers and together they constrain the labor market. This situation challenges each government to focus on measures socially oriented against poverty. In addition, more than 90% of the sectors are in the informal sector and constitute a huge loss for the state's revenues and therefore limit public spending. Structural transformation is not only important as a foundation for productivity growth and per capita income, but also as a mechanical system for economic diversification. Conducting this study in the Beninese context requires an organization of the problematic into research questions to illuminate the blind spots in Benin's structural transformation. The idea of this study is to bring solutions to the obstacles so that the structural transformation of the Beninese economy is an asset for its development.

The current government policy seems promising regarding effective structural change. Firstly, a less corrupt economic and social environment than in the past, the judicious management of resources and structural efforts are already a sure foundation in the process of structural transformation of the economy. It is also important to look at the political factors that favor the process of improved transformation.

Comparing Benin's economy to Indonesia's, a clearer picture emerges for the need of Benin to reallocate its labor force efficiently and to organize its economic system well. The following figure shows the difference between these two economies by grouping three main sectors: agriculture, industry and services.

Indonesia's industrial sector is found to be growing strongly between 1980 and 2019 in all three sectors. Agriculture is becoming less participatory due to its low productivity in economic growth. In contrast to the Beninese context, agriculture's participation is high in all three sectors, rising from 23% to 29%, while Indonesia's is falling from 22% to 13%. Industry in Indonesia has an upward trend, although it is stable at an average of 45%, while Benin's industry has a downward trend, declining from 26% to 19%.

The declining percentage of industry in Benin shows that the various implications of struc-

Figure 3: The percentages of three sectors of Benin compared with Indonesia.
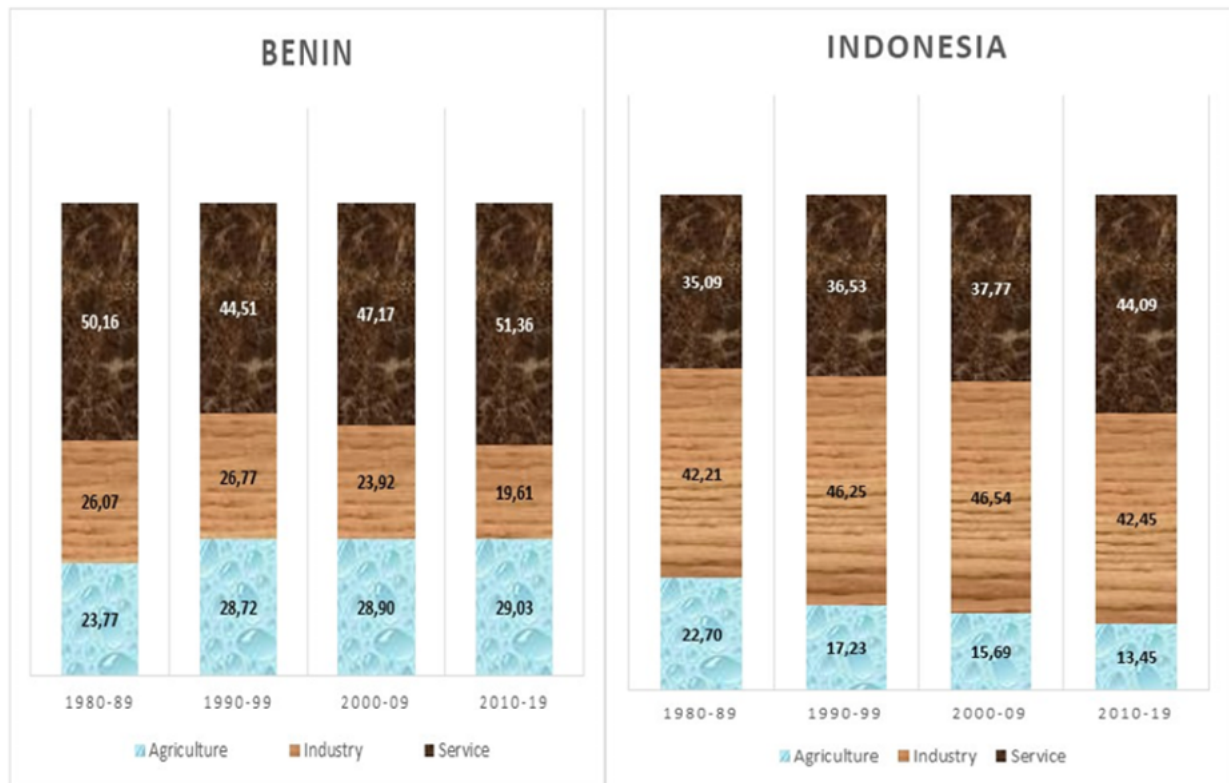
Source: Author based on data from WDI

tural transformation are not benefiting the country. Indonesian economic policy seems to focus more on the industrial sector and minimizes the reallocation of factors to agricultural production. Although the service sectors remain fairly similar in both cases, the two countries do not have the same notions of structural transformation. This leaves many questions about the labor market unanswered when one considers that this factor is more mobile than the capital factor in the production function.

The labor market in Benin presents an aspect that is not conducive to a system of structural transformation. Between 1995 and 2019, employment in agriculture has shown a downward trend, but it is very small and its gap with employment in the industrial sector remains very large.

In contrast to Benin, the labor market in Indonesia has reduced the agricultural labor force to less than 30% while that of Benin is still about 40%. Indonesia's industrial labor force is increasing over time (Figure 5) while Benin's is decreasing over the same period (Figure 4).

From this perspective, there is a tyrannical need to create millions of productive and

Figure 4: Employment in three economic sectors in Benin.
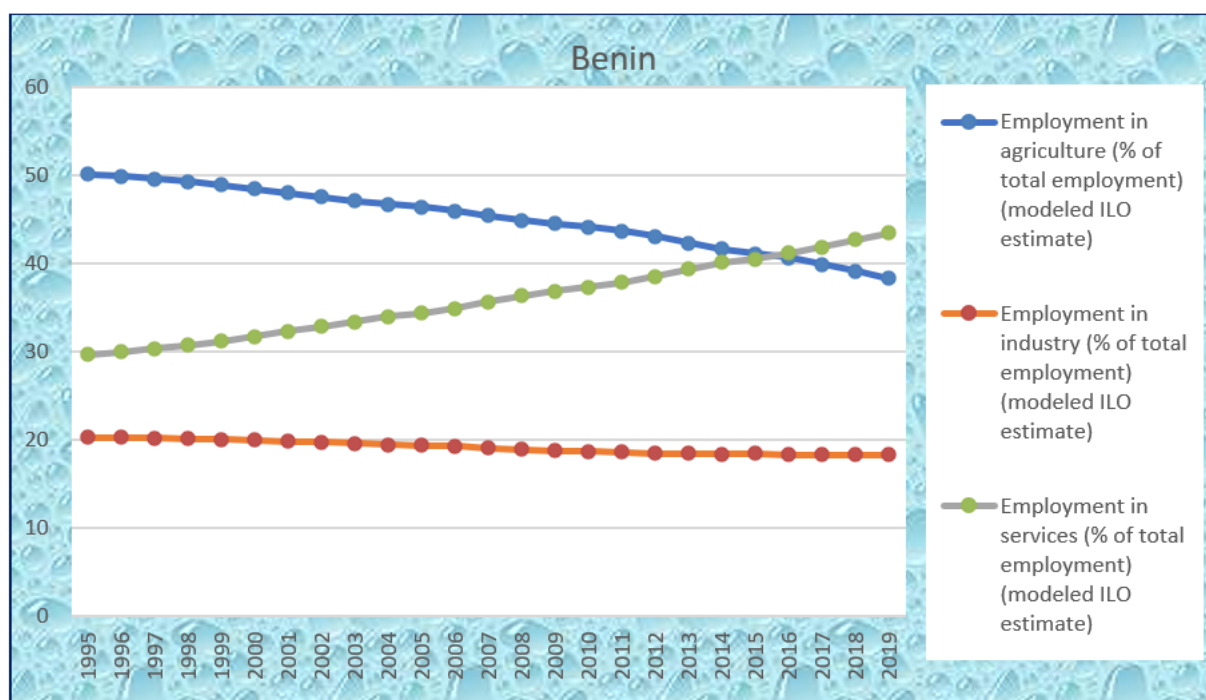
Source: Author based on data from WDI

Figure 5: Employment in three economic sectors in Indonesia.
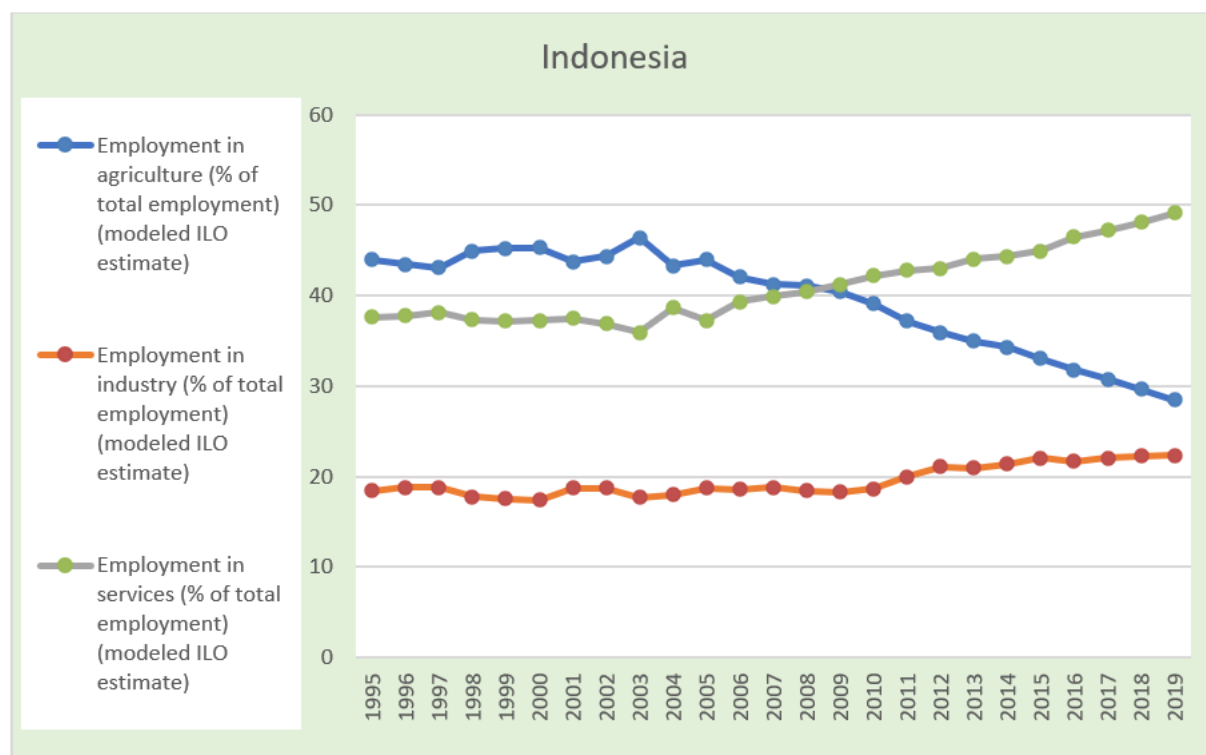
Source: Author based on data from WDI

better-paying jobs for young people as well as for the surplus agricultural labor force. However, this would be difficult, if not impossible, without a structural shift that moves workers from low-productivity agriculture and informal activities to high-productivity industries in the modern, non-agricultural sectors of the economy McMillan and Rodrik (2014).

Benin's economic growth rate was expected to be 7.6% in 2019. The primary sector contributed 1.2 points, the secondary sector 1.4 points and the tertiary sector 5 points of the Gross Domestic Product (GDP) (BASSE et al., 2021).

2.1.1   Labor productivity in Benin

The primary sector remains the primary source of Benin's wealth. Starting with agriculture, fishing and livestock breeding, these sectors make considerable use of a large labor force, but unfortunately do not contribute to economic growth to the same extent as this labor force. Corn, rice and cassava are crops that are more favorable for local consumption. Cash crops are generally cotton, pineapple, cashew nuts and oil palm. In general, the value added of the primary sector has increased slightly over the past ten years (Figure 6).

The added value of agriculture over the last ten years is on average 26.67% of GDP with its high percentage of employability of the workforce. However, it still ensures the country's food security. Benin is the leading cotton producer in West Africa with very relevant progress in its harvests of the Beninese white gold. Apart from cotton, soybeans, cashew nuts and rice are also some of the important products of Beninese agriculture. Cassava is the most cultivated product, followed by yam and corn, while cotton is only the fourth product in terms of tonnage[5] . Livestock production has grown significantly over the past twenty years. In fact, ruminants are the most widely raised animals in northern Benin. Cattle, sheep and goats are estimated at a quantity of 2,166,000 ; 860,000 and 1,716,000 head of animals respectively in 2013 according to statistics from the Benin Chamber of Agriculture (CAB). Pigs, on the other hand, are much less developed with about 414,000 head and poultry estimated at about 17.5 million[6].

With regard to fishing, fishery products were estimated at 43,800 tons in 2014, of which

---

[5]Benin Chamber of Agriculture (2018) (*htts* : //*chambreagri.bj*)

[6]CAB, 2018 Agriculture in Benin - Wikipedia (wikipedia.org)

Figure 6: Value added in different sectors.
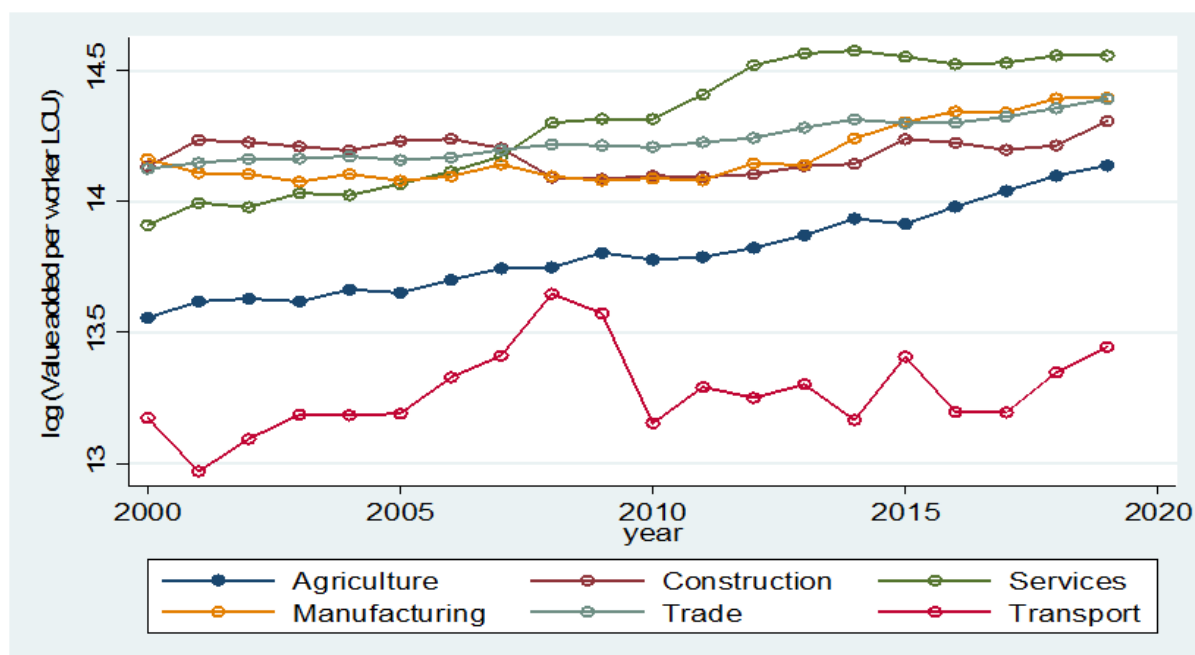
14,100 tons came from marine fishing and 29,700 tons from inland fishing. The value added of the primary sector compared with industry shows that these two sectors have kept an import gap since 2011 and this gap appeared to be narrowing as of 2018. Agriculture is still archaic, and livestock farming is not well linked to agriculture. Fishing is still rudimentary, and Benin's primary sector is still experiencing enormous difficulties, even though it is the sector that absorbs the majority of the active population.

2.1.2 The industrial sector

Benin's industrial sector generally includes construction, manufacturing and industrial zones. The value added per worker in construction and manufacturing averaged USD 2,884,617 and USD 2,760,208 respectively between 2000 and 2019. These two sectors of Benin's industry are evolving almost proportionally.

2.1.3 The tertiary sector

The tertiary sector (Figure 8) is the heartbeat of the economy and accounts for more than 50% of the country's GDP despite a popular migration into the informal sector.

Figure 7: Value added per worker in construction and manufacturing sectors.
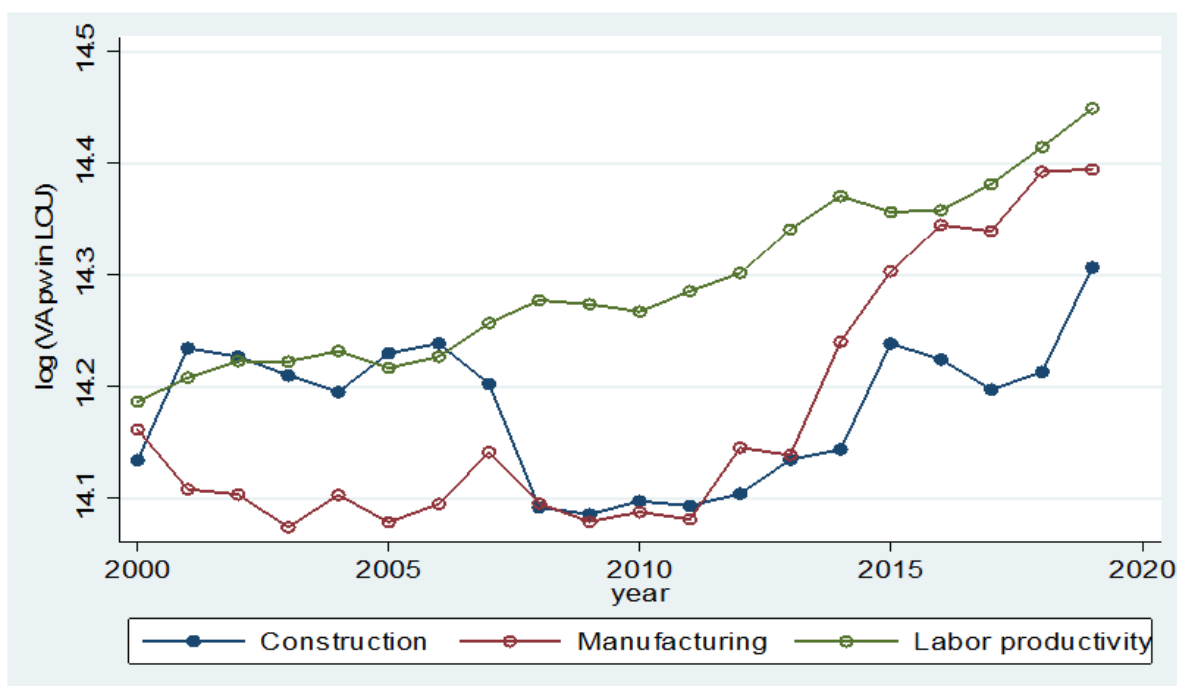
Trade is a large sector that occupies a good part of the Beninese population, especially with its geographical location bordering the giant nation of Nigeria, which presents a large consumer market. However, Benin's trade balance is in deficit due to the import of products. Benin's mineral resources are a great asset for the economy but are generally poorly exploited. Benin's tertiary sector also includes services, finance, transportation, and tourism (Ouidah beach, the royal plateau of Abomey and Porto-Novo). The parks in the North of Benin and many other important places for tourism, the **W** park very rich in fauna, the famous Atacora chain, the natural landscapes of Tanougou and the Kota waterfalls, are all assets favorable to the tourism sector of Benin with the Oueme valley (the second largest valley in Africa).

2.2   Employment in different sector in Benin

Benin has an economic system that is mainly dominated by the primary sector, which absorbs the bulk of jobs. According to the results of the survey on the transition from school to work of young people in 2012, the primary sector employs 42%, the secondary sector 18.9% and the tertiary sector employs 38.9% of the active population in these three

Figure 8: Value added per worker in Tertiary Sector.
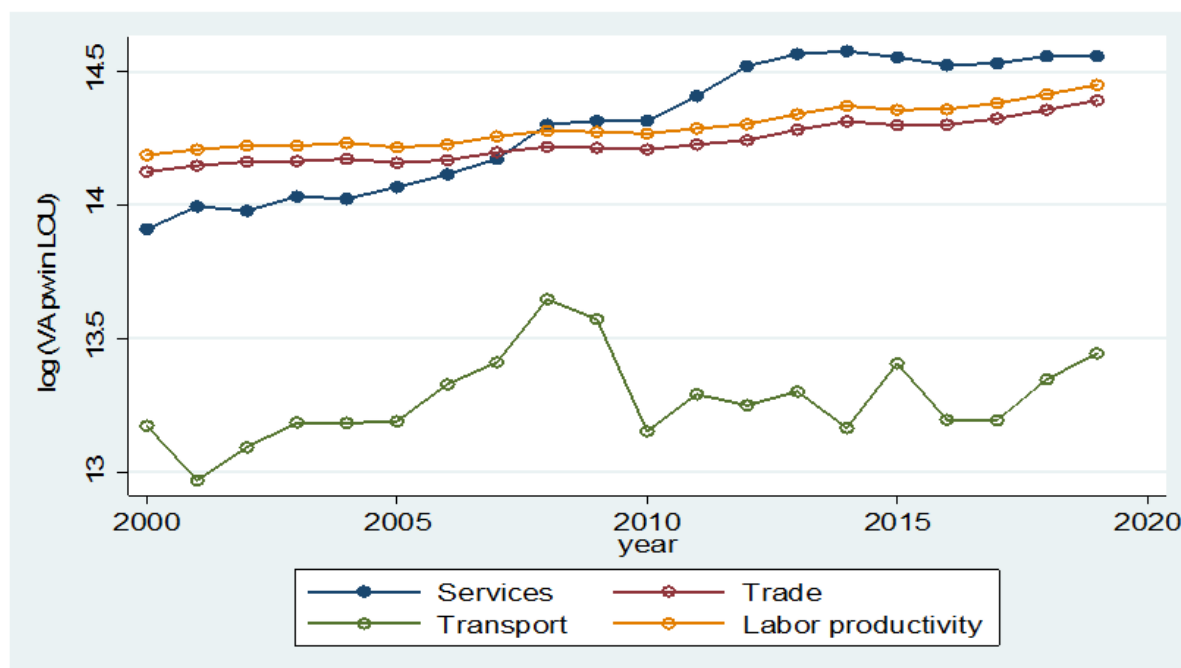
main sectors of the Beninese economy (Report, 2013). The high unemployment rate that verses a high poverty rate even though this rate is decreasing, remains stubbornly high at about 51% (Haile, 2018).

Total employment in Benin has increased slightly over the past decade at the same rate as the labor force in the three main sectors of the country's economy. However, agriculture and services remain the two main sectors that employ the most Beninese workers. We can say that there is a change in the structural transformation policy when employment in agriculture decreases over time and employment in construction and services increases over time. This is not the case in the Beninese context. Benin needs to build a strong economic system as shown in the figure n°9. The well-being of the population is built through several components. Starting from a good state of health of the individual, employment is required to earn income in order to provide for basic needs. The emergence of the economy supposes a social progress and an improvement of the human development index. Economic growth comes from a well-improved structural transformation that eventually leads to a sustained macroeconomic system.

Figure 9: Employment in different sectors in Benin.
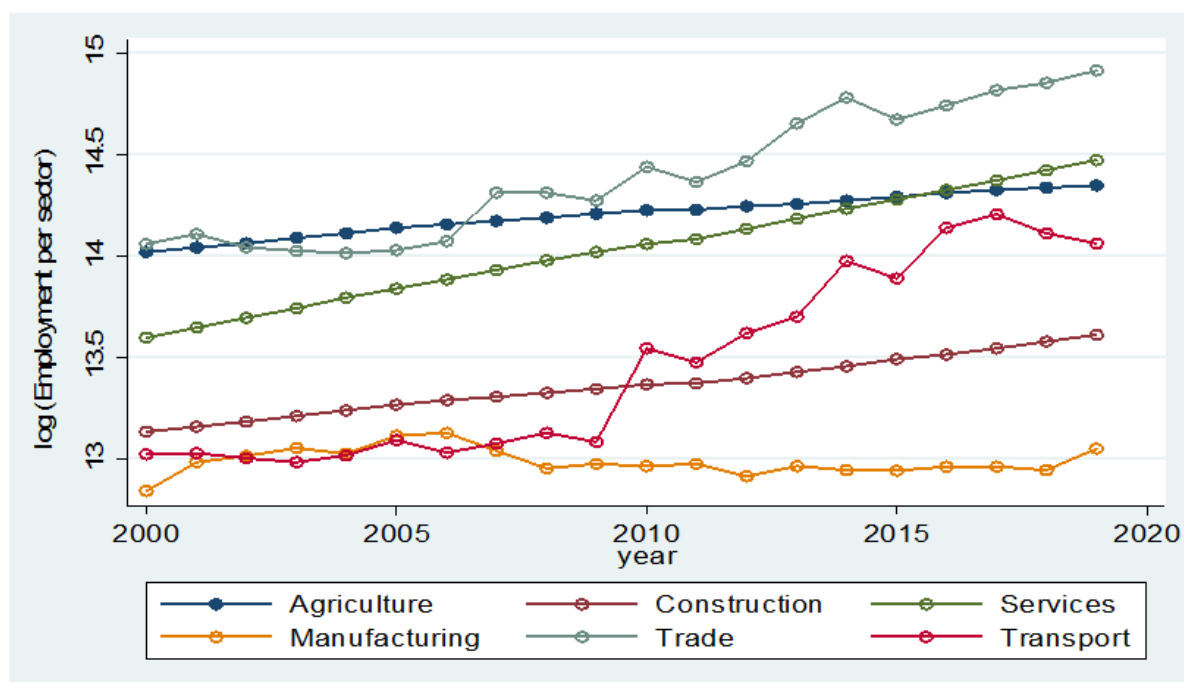
2.3 Labor productivity and employment in WAEMU

Structural transformation involves the level of labor productivity after an observed level of employment change. Over the last two decades (2000-2019), the commitments of WAEMU countries offer a new look of their economies have resulted in some more or less important outcomes. The three main sectors of the economy (agriculture, industry and services) have varied disproportionately. Table 4 provides information on the evolution of structural changes between 2000-2010 and 2010-2019.

Table 4 Level of productivity and employment in WAEMU.

Sectors	2000-2009		2010-2019	
	Productivity(%)	Share Employ(%)	Productivity(%)	Share Employ(%)
Agriculture	28.40	61.09	22.49	48.00
Industry	31.28	10.97	32.73	15.41
Services	40.32	27.94	44.78	36.59
Overall sectors	100	100	100	100

Figure 10: Structuring the economic system of Benin.
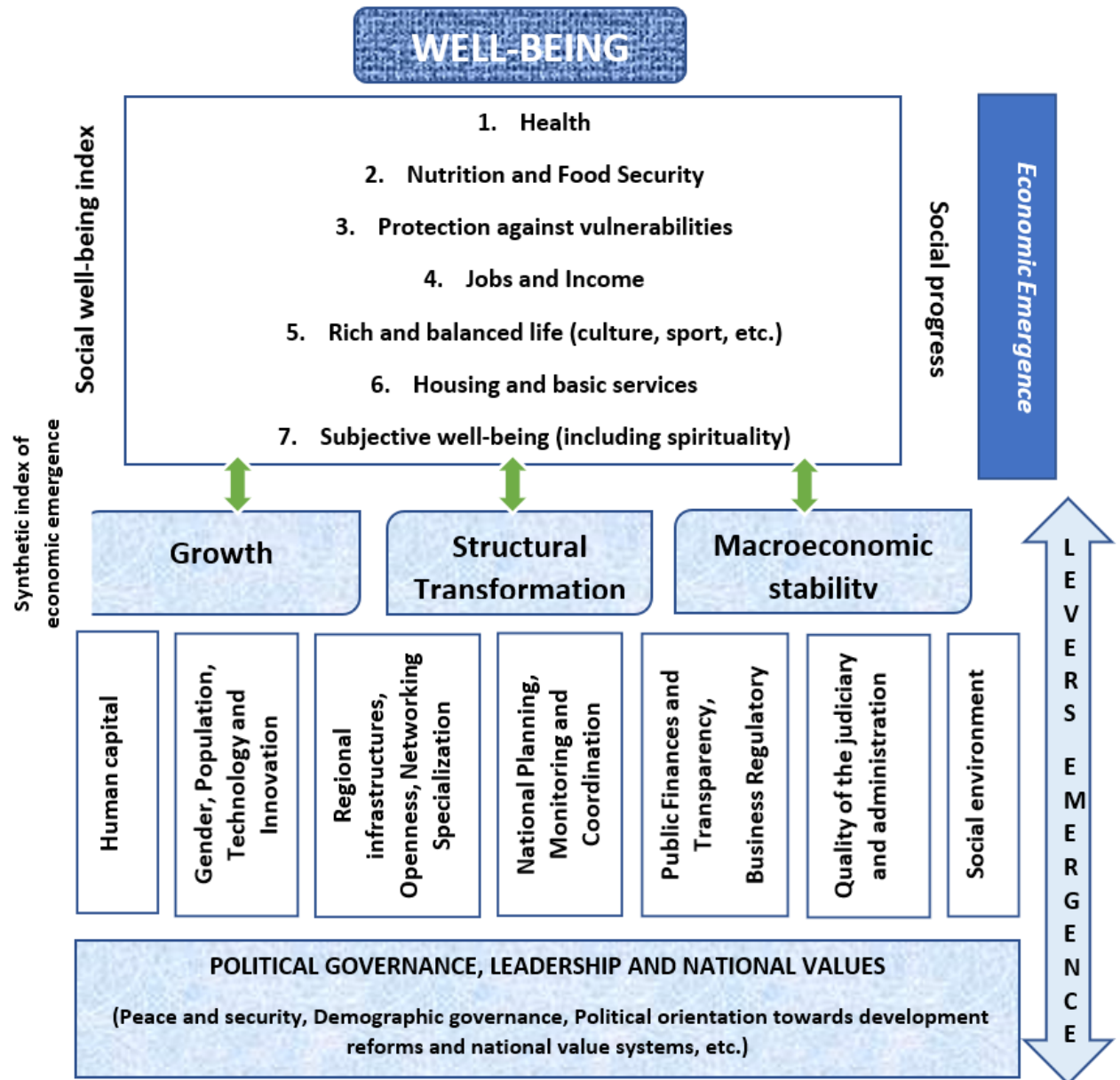
Source : By Author based on the information of country.

This means that during this period, the agricultural sector reduced its labor force by just 7% and its once low productivity also dropped by about 10%. The industrial sector increased its labor force by one percent and its productivity increased by 2%. About 6% of the labor force increased in the service sector for productivity to increase by more than 8%. The idea behind these changes is that in all eight WAEMU countries, the agricultural sector is the only hope for the population and many local investors are investing in this sector. Agriculture (cotton, pineapple, corn,.) is the first sector of Benin's economy employing more than 70% of the active population but contributing to 32% of the GDP[7]. While in Burkina Faso, agriculture is mainly cotton, sesame and cereals, and employs more than 82% of the active population but only accounts for 35% of the country's GDP[8]. For Côte d'Ivoire, cocoa, cashew nuts and rubber are the main agricultural products. This country has turned agriculture into a sector of industrial crops and exports, and as a result, its economy is based on 50% of agriculture. In Mali, nearly 75% of the active population is involved in agriculture, which accounts for approximately 45% of GDP. These stylized facts show how many times African countries have focused on agriculture as the center of their economy while agriculture sector only contributes little to the GDP.

These trends show that WAEMU countries need to think about creating several industries to absorb the surplus jobs in agriculture. Increasing employment in industry and reducing employment in agriculture remain the only socio-economic policies for these countries. The industrial sector is the great obstacle to the development of the African economy. Agriculture produces the raw materials that are exported to the outside world for industrialization.

Unlike Figure 11, figure 12 shows the opposite trends of productivity in the three sectors. Indeed, agriculture is the sector whose productivity has declined over the two decades, yet it employs a large number of people. Industry, despite its low rate of employment (about 10%), has a productivity remains slightly higher than the of agriculture sector. Services, on the other hand, have experienced significant productivity growth.

In short, labor productivity in the agricultural sector is moving in the opposite direction compared to the other sectors (industry and services). It implies on the necessity to

---

[7] https://fr.wikipedia.org/wiki/Agriculture au Bénin

[8] Agriculture au Burkina Faso — Wikipédia (wikipedia.org) https://fr.wikipedia.org/wiki/Agriculture au Burkina Faso

Figure 11: Employment in percentage in WAEMU.
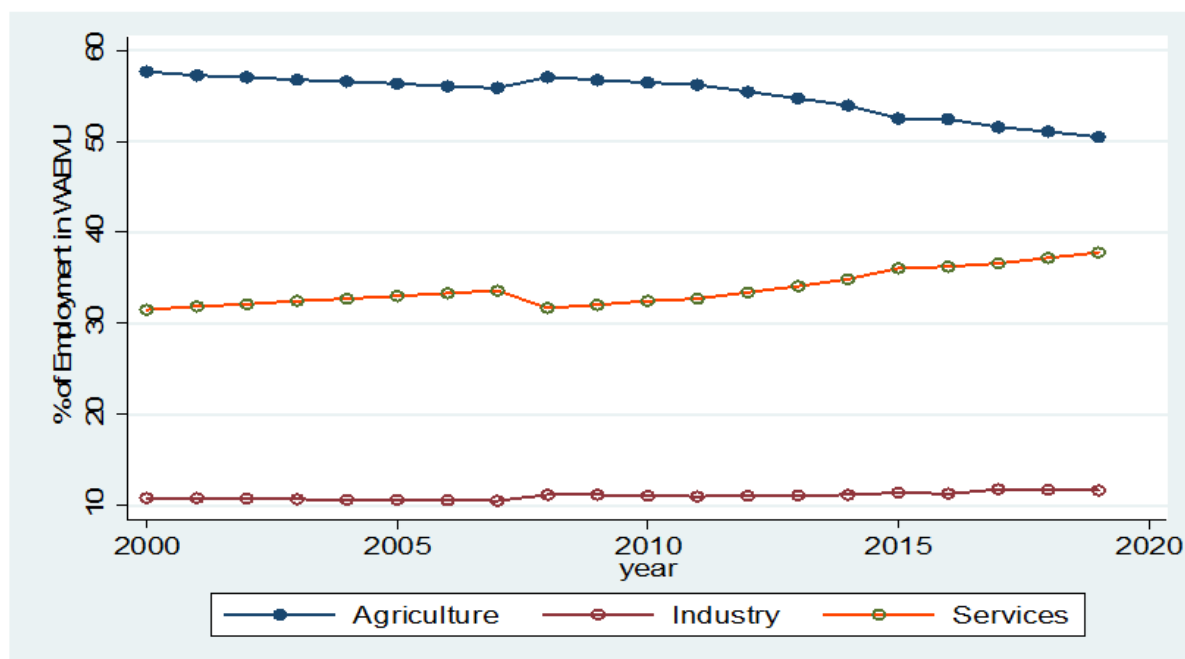
Figure 12: Productivity in percentage in WAEMU.
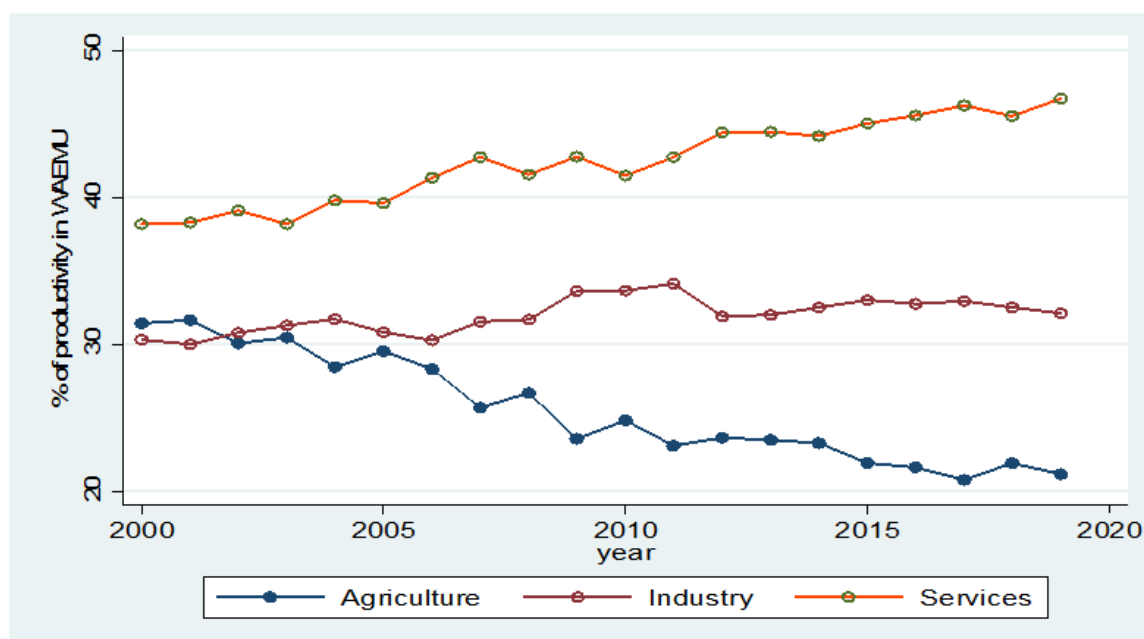
Figure 13: GDP per worker in each country.
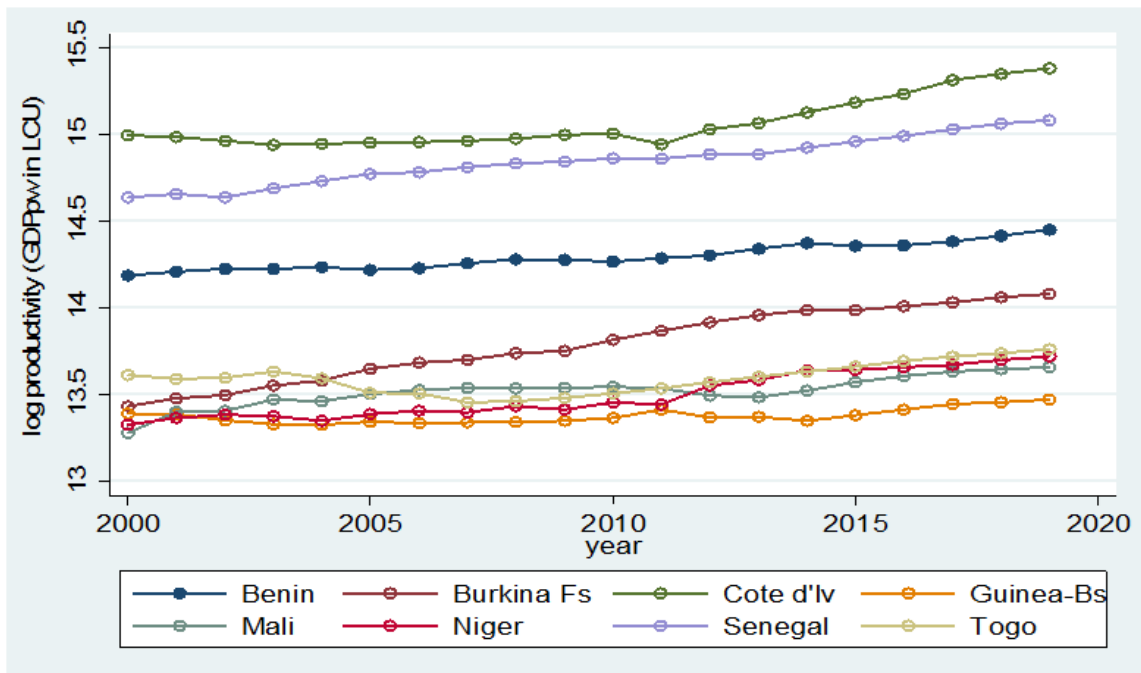
replace the labor force in agriculture perhaps by machines and to make the labor force work in the industrial and service sectors. Looking at productivity individually in the WAEMU zone, it shows that not all countries have the same productivity levels. This is normally justifiable because economic policies tend to be the same, but in reality, they are implemented differently and depend on the country. In figure 13, Côte d'Ivoire is the country with the highest productivity. Towards the end of the first decade, Côte d'Ivoire's productivity declined and then resumed its upward trend in the second decade. This first decline is certainly due to the political instability that the country experienced. Following Côte d'Ivoire, Senegal does not demerit its position as the second country with a better productivity than the other six countries analyzed. Senegal has experienced a slightly upward trend. Benin is in third place among WAEMU countries and has productivity growth slightly up behind Senegal. Labor productivity in Burkina Faso has been growing strongly over the two decades even though it is still lower than in the three countries mentioned above. If this pattern of Burkina Faso's productivity is sustained and the other countries above it do nothing, it will surely take the lead in the years to come because the slope of its productivity curve is much steeper than the others. Finally, the last four countries showed similar trends on the graph. These are Guinea-Bissau, Mali, Niger and Togo, which have recorded low levels of labor productivity over the past two

Figure 14: Employment in each country.

decades.

Figure 14 shows the trend in employment over the two decades of the study in WAEMU countries. Indeed, we observe a similar evolution because the slopes are almost the same, apparently forming parallel lines on this map. Niger and Côte d'Ivoire are in first place and Mali in third place; those are the countries where labor is most in demand. Only Burkina Faso had a low level of employment during the study period. This low level of employment may be justified by its very steep slope in labor productivity and also perhaps by the control of demographics in Burkina Faso.

2.3.1 Agricultural sector

Despite its low productivity, it is developed in different ways, which leads to different results from one country to another. When we compare the value added per worker, Côte d'Ivoire is the country with the best productivity over the last decade. In the first decade, Benin had slightly higher productivity than Senegal. In the second decade, Senegal experienced an increase in productivity that even rivaled that of Côte d'Ivoire. Countries such as Burkina, Mali, Niger, and Togo follow a similar pattern in the second

Figure 15: Productivity in each country in agriculture.
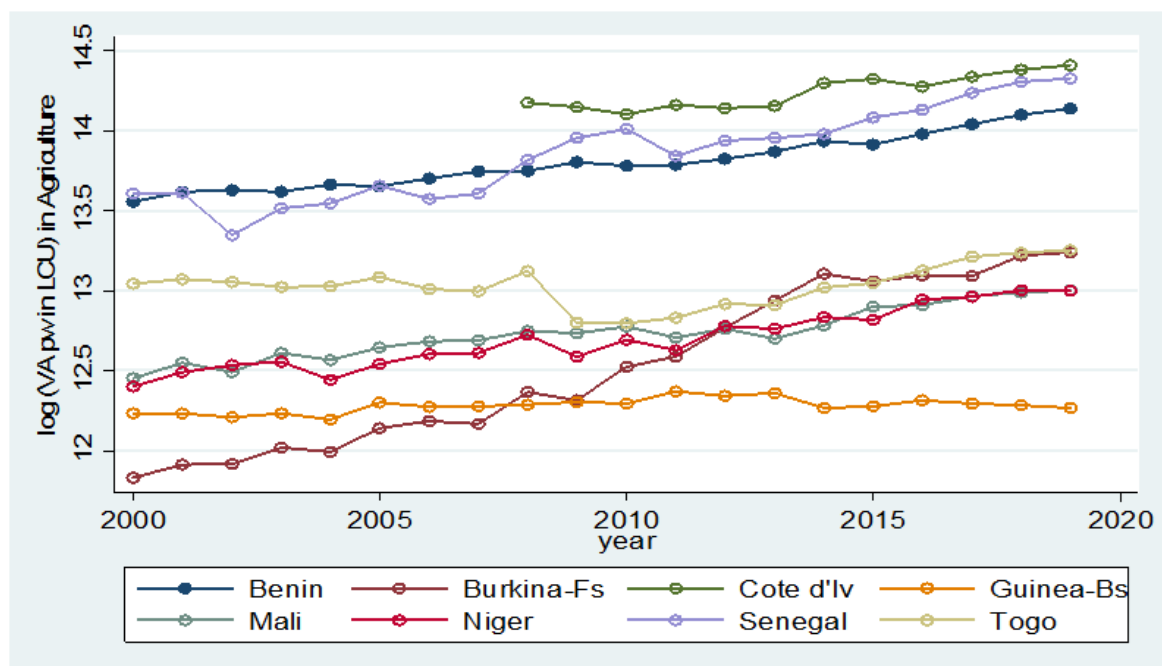
Source: Author based on data from WDI

decade and thus form a second group of countries with productivities that are roughly in the same value ranges. Guinea Bissau, on the other hand, recorded an almost stable evolution over the two decades and remains the lowest productivity of the WAEMU countries over the second decade.

Côte d'Ivoire, Senegal and Benin have significantly industrialized the agricultural sector over the last decade, which has made it possible to observe these results. Policies for the mechanization of agricultural practices, the strengthening of the chemical input system and the marketing of the most widely cultivated products such as cocoa, millet and cotton have made agriculture an important sector in these countries.

A comparison of employment trends in WAEMU countries shows that Niger remains the country where agriculture employs the largest share of the active population. During the first decade (2000-2010), Burkina Faso employed more people in agriculture than the other countries. The trend was downward throughout the period for Burkina Faso and Senegal while other countries such as Niger, Côte d'Ivoire, Mali, Togo, Benin and Guinea-Bissau have a slightly increasing trend. Between 2000 and 2015, a policy of considerable labor force reduction was observed in Burkina Faso. The analysis suggests that there has been a structural change between the agricultural sector and other sectors or that there has been a phenomenon occurred causing the reduction of the agricultural labor force in

Figure 16: Employment in Agricultural sectors in each country.
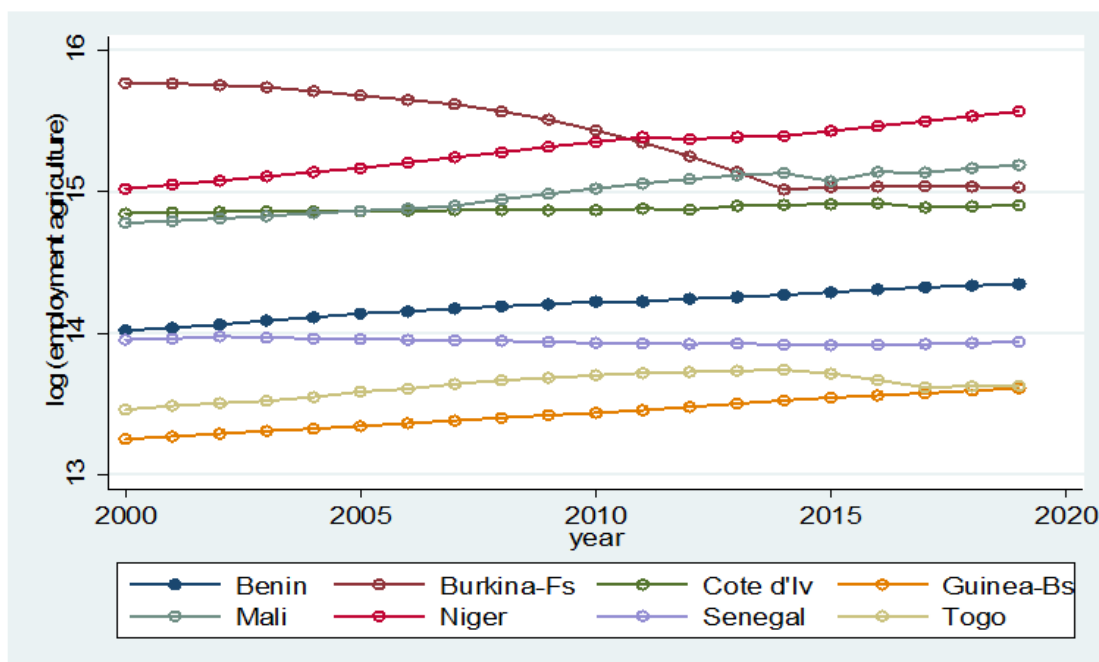
Burkina Faso.

2.3.2 Industrial sector

In the industrial sector, the same observations are noticed in the case of agriculture for Côte d'Ivoire and Senegal. We find that there is a considerable gap between the productivity of these two countries and of the other six countries. Niger, Mali, Benin, and Guinea-Bissau show almost stable trends, while Burkina Faso and Togo show a downward trend, especially during the second decade.

The comparison on this map shows that the value added of the industrial sector in Côte d'Ivoire has accelerated after falling in 2012. In addition, the positive slope of this variable is more pronounced than in other countries. This implies that Côte d'Ivoire is operating a good joint policy between the agricultural and industrial sectors. Raw materials from agriculture are transformed into finished or semi-finished products for national, regional and international consumption. In this way, the demand for labor will be strong and as agricultural workers are replaced by the market, the industrial sector will hire much more labor. This seems to be the case in Senegal as well.

Figure 17: Productivity in industrial sector in WAEMU.
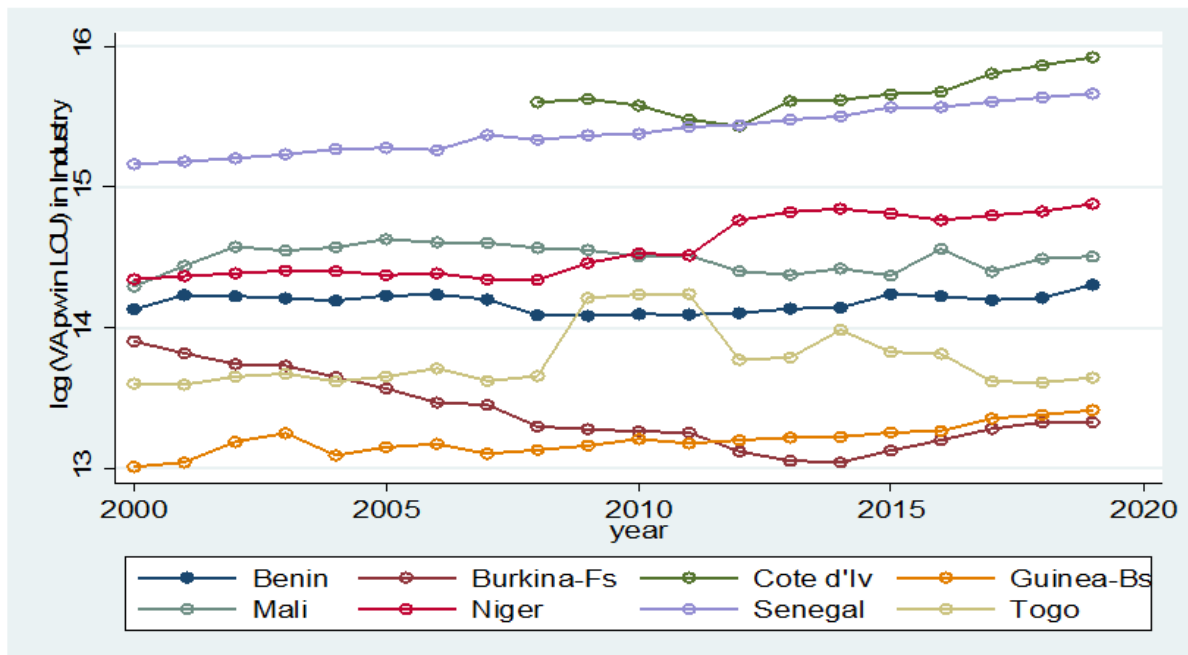
Source: Author based on data from WDI

Figure 18: Employment in Industrial sectors in each country.
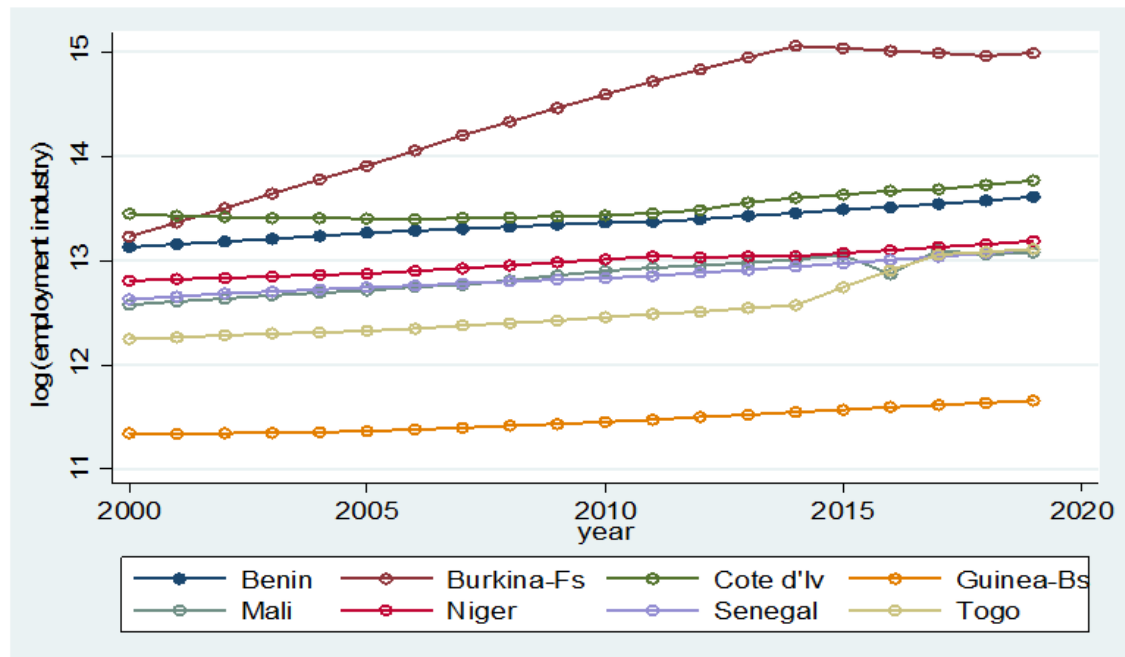
Source: Author based on data from WDI

Figure 19: Productivity in each country in services.
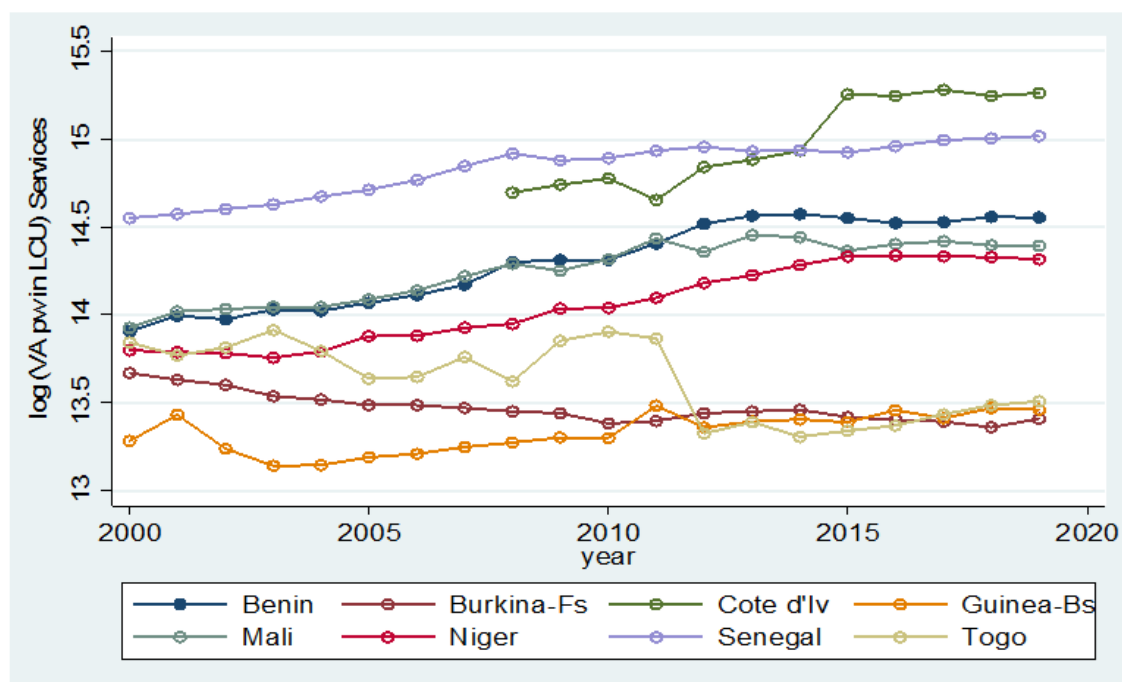
As for the industrial sector, it should be noted that Burkina Faso experienced strong growth in labor force hiring during the study period, even though the trend over the last five years has been stable, with a very pronounced positive trend. After Burkina Faso the ranking order the countries which recorded a slight upward trend are: Côte d'Ivoire, Benin, Niger, Senegal, Mali, Togo and Guinea-Bissau. Based on the analysis, Burkina Faso has reduced its agricultural labor force (see figure 16) to compensate for the labor market in the industrial sector. In general, however, all countries showed an upward trend, although the trend was more pronounced in Burkina Faso than in the other countries. This is a good structural policy for economic change in the country.

2.3.3 Tertiary sector

Regarding the service sector, considered as the tertiary sector in this study, we note that Senegal performed well until 2014 when Côte d'Ivoire took the lead over all WAEMU countries in terms of value added per worker. In general, Côte d'Ivoire, Senegal, Benin, Mali and Niger showed a slight upward trend. Burkina Faso, Togo and Guinea-Bissau, on the other hand, recorded a downward trend.

Figure 20: Productivity in each country in services.
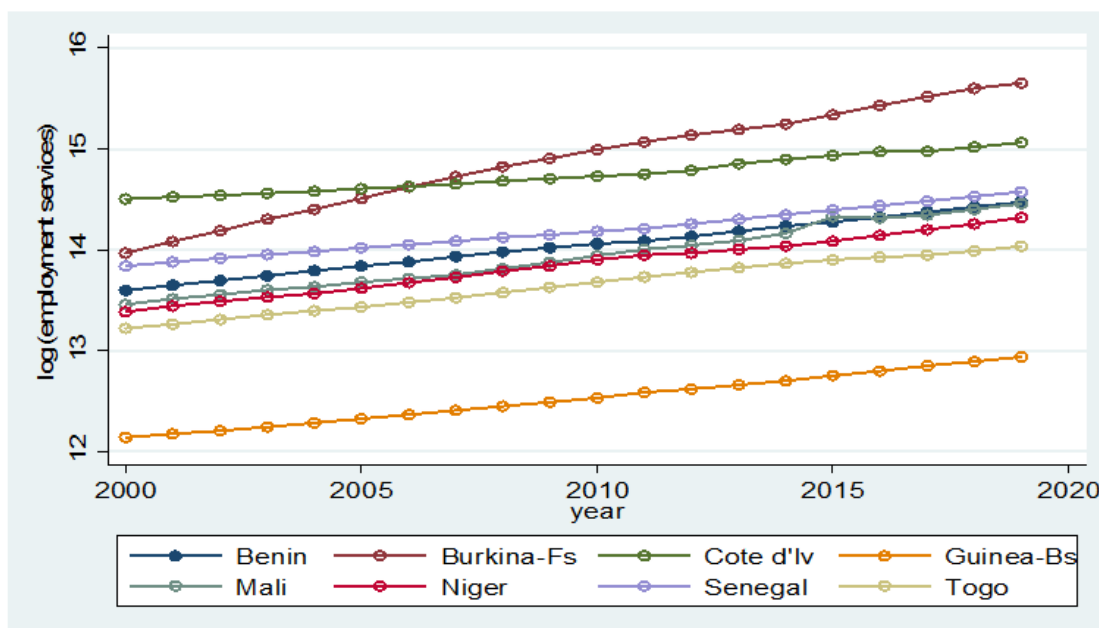
Employment in the services sector in WAEMU countries has shown an upward trend over the entire study period. However, it varies from one country to another depending on the socio-economic context of each country. Indeed, Burkina Faso has observed a steeper and more upward slope in employment in comparison with the other countries in the zone. Senegal, Benin, Mali, Niger, and Togo are in the same ranges of labor force employability on the study map over the two decades. Although Côte d'Ivoire is the country that has employed the most labor in the first five years, the strong slope pronunciation of Burkina Faso has caused Côte d'Ivoire to fall behind Burkina in the past fifteen years. In the services sector, Guinea-Bissau is the country that employs very little labor.

Chapter 3

Literature review

Structural change as a reconfiguration of the productive sectors of the economy has been the subject of several literary interventions, both theoretical and empirical. Thus, various angles of structural transformation have been analyzed in different contexts and by different authors. Starting from the idea of the mobility of the productive factors towards innovative activities already resembled the Schumpeterian theory that develops the idea of : "destruction to creation" (Schumpeter, 1911). According to this author, it is necessary to destroy a sector to create another. After this theory, other research works oriented on the concept of structural change have highlighted the causal link between the change in the structures of the economy and economic growth in time and space. To demonstrate this link, some studies have focused on the effects of labor productivity before linking its implications to economic growth. To clarify these theories, this section of the literature review will briefly discuss three different key parts. In the first part, a general view on structural transformation and labor productivity will be discussed. The second part will be devoted to the different concepts that have been discussed in the literature. Finally, the third part will focus on the role and strategies of the state in the process of structural transformation.

3.1 Structural transformation and labor productivity

Structural change can affect economic growth in several ways. The literature generally points to a causal direction between structural transformation and economic growth. In-

deed, some authors argue that there is a positive relationship between structural change and economic growth. In the same way, others demonstrate the opposite direction of this relationship between structural transformation and economic growth. This is the case, for example, with the results of Hartwig (2011) empirical work on the United States and in some fifteen European countries, which find that structural change has a downward effect on economic growth. This idea of an inverse relationship is not new in the economic literature as it goes back to the work of Baumol and Bowen (1965), Kaldor (1966) and Timmer (2009).

According to Fisher (1939), as the economy evolves, there is a mechanism that allows the primary sector to move to the secondary sector and finally to a large service sector. This transition, highlighted by the Clark-Fisher model, shows that development will eventually lead the mass of the workforce to work in the service sector Clark et al. (1967). For this author, the increased income elasticity of demand and the low productivity of labor are the two deductions granted to the occurrence of the service sector after industrialization (Jose, 2019). Theorically, structural change modeling work has been systematically explored and documented by Kuznets and Murphy (1966). This Author uses cross-sectional data and temporary trends from the United States and other developed countries for this study. He finds that as the economy grows, resources are transported from agriculture to the service and industrial sectors. The results of this study showed that labor productivity through its growth was faster in the manufacturing and service sectors in developed countries. They also show that the reallocation of labor from low to high productivity sectors constitutes about one-fifth of the overall increase in labor productivity. This was the view of Solow (1956) who identified that the reallocation of labor from low productivity sectors to more productive sectors would result in improved economic growth.

In the economic system, services occupy a very important place due to its high productivity. Despite its importance in the engine of the economy of nations, it is at times a sector that does not promote economic productivity in an accelerated way. Greenhalgh and Gregory (2001) have also pointed out that developed countries have understood the importance of structural change in the development process, and this has led them to change the structuring scenarios of the economy since the 1980s. Thus, in these developed countries, services are transformed into an emancipated power of job creation and production. There is a strong demand for products and services in tertiary and industrial sectors. As pointed out by Galdar (2019) Griliches and Regev (1995), Baily (1992) and

Russo Giovanni (2001), the difference in the gap between the service sector (see figure2) and the manufacturing sector has decreased considerably in these developed countries. In a study on the impact of labor productivity on structural change in India, Jose (2019) noted that even though productivity growth in manufacturing is higher than in services, the service sector contributes nearly half of national income. The theory was shared in the work of Park and Shin (2012), who made the point that the service sector has been abundantly involved in Asia's productivity and GDP growth. In a collated study of the latest performance of China and India, after 1993, the industrial sector participated in nearly 60% of China's overall productivity growth. While in India, the service sector contributed 45% of the country's productivity growth (Bosworth and Collins, 2008).

In developing countries, the manufacturing sector is a powerful engine for economic development. According to Rodrik (2013), there are three reasons that may underlie the power of the manufacturing sector in developing countries. First, the author believes that it is easily affordable to implement technology from abroad and take advantage of it to create high productivity jobs. Second, in the manufacturing sector, the jobs created are not subject to high skill requirements. This implies that surplus employment in agriculture can be transferred to the manufacturing sector without large training cost and skill requirement for the manufacture of finished or semi-finished products. Finally, as the manufacturing sector increases in output, exports may increase and promote a fairly large opening for international trade.

Yu and Démurger (2002) examine manufacturing and find that manufacturing is divided into three broad classes. In the first class, there are the consumable industries. These branches are generally recognized by a low capital intensity and are represented by the heavy industries (mines, metallurgies, transformations of raw materials...). The second class is the intermediate goods industry, which generally concerns chemicals and metals. This sector requires more heavy capital, explaining why it is turned more towards the outside due to its heavy investment. It illustrates how the labor force of developing countries is unable to a high productivity sector. Finally, the third class concerns the capital goods industry, which is highly capitalized and export-oriented. The literature shows that the manufacturing sector plays an important role in the development process and offers more growth opportunities to a country's economy (Rodrik, 2009). Like many developing countries, Benin seems to be a country with the potential to be a developed economy but the system of factor allocation between activities is certainly not yet on the right track.

The movement of labor between agriculture, industry and services is a lever for labor productivity. This is precisely the idea of McMillan and Rodrik (2011) who believe that for developing countries, moving labor from the agricultural sector to a non-agricultural sector, focuses on the fact that in the agricultural sector, productivity is low. In the 2016 International Fund for Agricultural Development report on Sub-Saharan Africa, agricultural labor productivity is 6 times lower than non-agricultural labor productivity. In other developing countries, this ratio is 4.5 times and in middle-income countries it is 3.4 times and 2.2 times in high-income countries. It is clear that certain factors contribute to this negative effect, such as natural resource endowment and universalization as well as policy and institutional frameworks. For McMillan and Rodrik (2014), generally, natural resource endowment has a downward effect on structural transformation growth because even though the extractive sectors operate at high productivity, they do not create many jobs that can absorb the surplus from agriculture (the description of the literature on the two models used in the document).

3.2 The role and strategies of the State in the process and technology

Focusing on the basis of the Schumpeterian conception, Kuznets and Murphy (1966) establishes the extended dimension of structural transformation by considering institutional and social variables. For this author, change in the sectors of the economy must first start from the will of institutions (government) and social (labor) before being implemented throughout the economy. The will of political institutions is to make good regulatory decisions to promote the business environment through facilitation and investor peace of mind. Furthermore, government investments in hopeful sectors such as industries. Social will is found in the proper formation of human capital adapting to new technology. This calls more deeply for a sense of good governance and the quality of human capital for a real transformation of the sectors. This important role of political institutions is seen as a development strategy and has a huge influence on the composition of GDP and employment Matsuyama (2009).

Given this necessary dimension of economic growth, Lavopa (2015) studies structural changes in development and examines two key aspects: "structural change" and "techno-

logical catch-up".

The policy of structural transformation that succeeds in eliminating hunger requires society to seize the best mix of market forces and government intervention. These governmental policies promote the process of economic growth that reaches the poor and ensures easy and reliable food supplies that are available and accessible to even the poorest households (Timmer, 2009). Moreover, there are existing non-economic factors that negatively influence the contribution of structural transformation. A few examples are social conflicts and natural disasters according to Rao and Vidyattama (2017) and Heger and Neumayer (2019).

In a study on globalization, structural change, and productivity growth, with an update on Africa, (McMillan and Rodrik, 2014), examined how different countries were able to manage the stresses and opportunities of advanced globalization. In order to do so, these authors demonstrated the existence of a huge divergence between countries and regions through the structural changes made by them. For countries that have experienced growing and successful development, structural changes have an important place, they said. However, countries in Asia, Latin America, and Europe have experienced structural changes that are quite favorable to their sustainable development. Africa is experiencing a decline in productivity with the same notions of structural change.

Concerning structural change in West Africa specifically on Benin, Burkina-Faso and Côte d'Ivoire (BBC), Haile (2018) finds that economic growth in these three countries has occurred in parallel with a rapid exodus of labor from agriculture. This author examined the contribution of intra- and inter-sectoral changes in aggregate productivity and output growth per capita since 2006. The author uses the Shapley decomposition technique and finds that productivity growth is modest in Benin, significant in Burkina Faso, and negative in Côte d'Ivoire. For Haile (2018), static structural conversion has driven economic growth in Benin and Burkina-Faso. His work shows that in the process of structural transformation, there have been gains and losses and that workers in agriculture are almost moving to services (trade) which are also low productivity activities contrary to the context of Asian countries. Despite the results of this work, the author did not conduct a causality analysis between the structural change and the productivity growth based on econometric principles. This suggests that the results found are still far from implementing the reality of structural change in all three countries and in Benin in particular. Using all the elements of structural transformation, several estimation methods

have been implemented to analyze the causal relationship between structural transformation and economic growth. We can mention the methods of Hall and Jones (1999), Acemoglu et al. (2006), Schreiber (2010); these methods studied the effects of "Effective structural change index" ESC on growth focusing on dynamic models. Moreover, Chen and Wu (2005) used the same dynamic model to study the relationship between structural transformation and economic growth in China. Vidyarthi (2017) and Andriansyah et al. (2020) use the same dynamic models to analyze these effects of structural transformation on growth on India and Indonesia respectively.

Structural changes have been a key factor to support the growth of East Asian countries. For example, China, India, and Thailand have shifted their growth patterns toward exports and the high-productivity tradable goods sector (Morsy and Levy, 2020). On the other hand, for Morsy and Levy (2020) structural change has played an important role in high-income countries, where productivity variation across sectors is lower and gains are particularly related to improved productivity.

Chapter 4

Methodology

4.1 Theory of structural transformation

There are two ways to achieve labor productivity growth in an economy. The first way refers to the accumulation of capital, technological innovations and the production factors of the enterprises. The second way refers to the movement of workers from low productivity sectors to high productivity sectors to increase labor productivity in the economy. In this process, productivity will increase in the sector that is more favorable to labor input accumulation. The economic literature generally retains the decomposition approach used by McMillan and Rodrik (2014) and Timmer et al. (2013), respectively, to explain structural transformation. The approach of McMillan and Rodrik (2014) is a continuation of the work of Fabricant (1942), Dunne et al. (1997) and Haltiwanger et al. (2001). It is established as follows:

$$\Delta P_t = \sum_{i=n} S_{i,t-k} \Delta P_{i,t} + \sum_{i=n} Y_{i,t} \Delta S_{i,t} \ (1)$$

With Δ the change operator P_t is the economy-wide labor productivity, $Y_{i,t}$ is labor productivity per sector; $S_{i,t}$ the variable that captures the share of employment in a sector i at a given date t. Thus, ΔP_t represents, in this model, the variation in labour productivity in the economy $\Delta P_{i,t}$ the variation of productivity of the sector i in time t and $\Delta S_{i,t}$ represents the variation in employment captured in the sector between t and $t-k$. Building on McMillan and Rodrik (2014), De Vries et al. (2015) extended this decomposition based on the inter-sector part into two components. This is a part

devoted to the within-sector effect (Within) and the second part captures the movement of employees to high productivity sectors called the between-sector effect (Between). The new relationship, which considers two periods, the initial O and the final T is as follows:

$$\Delta P = \sum_i (P_i^T - P_i^0)S_i^0 + \sum_i (S_i^T - S_i^0)P_i^0 + \sum_i (P_i^T - P_i^0) \cdot \sum_i (S_i^T - S_i^0) \quad (2)$$

The variables S_i and P_i represent employment and productivity in the sector respectively i. In this equation (2) the first term captures the *Within effect*, the second refers to the *Between effect*, and the third represents the cross-sectional (interaction) term according to Timmer (2009) and Van Ark (1996). The part within the model represents the joint effect of transformations in the employment and productivity shares in each sector. Despite this approach to measuring structural transformation, (Krüger, 2008) believes that there is an important interaction between productivity and structural transformation. The author is interested in productivity, as the more it increases (due to the results of changes between sectors), the more favorable is the economic development. The difference between this method and the previous one is the explanation of the benefit of structural transformation for stimulating economic growth. In order to measure the qualitative and quantitative aspects of structural transformation, this approach uses four (4) measurement principles. These are two quantitative aspects: the index of structural transformation and the index of the absolute value of the norm, and two qualitative aspects: the job-sharing method and the index of effective structural change (Andriansyah, 2020).

4.1.1 Structural change index (SCI)

This index simply captures the general structural transformation from the calculation of the share of value added between the initial period 0 and the final period T. It is formulated as follows:

$$SCI = \frac{1}{2} \sum_{i=1}^{n} \mid VA_i^T - VA_i^0 \mid \quad (3)$$

In this equation n denotes the number of sectors, VA_i^T and VA_i^O represent, respectively, the distribution of the value added of the sector i to the time T and 0. The advantage of this approach is that it makes it possible to measure structural change more quickly on the basis of the actual reallocation of value added. Unfortunately, it does not explain whether this reallocation is directed towards a good or a bad sector. More simply, economic growth cannot be explained through this index, hence the need for the following formula.

4.1.2 Norm Absolute Value Index (NAVI)

Unlike to SCI, $NAVI$ uses the employment share instead of the value added. It is formulated as follows:

$NAVI = \frac{1}{2} \sum_{i=1}^{n} \mid S_i^T - S_i^0 \mid$ (4)

S_i^T and S_i^0 represent respectively in this equation, the share of employment in the sector i between the initial period 0 and the final period T. This index measures the shift in employment but does not explain the link between this shift in employment and productivity. The criticism of this index is that it does not differentiate between the structural change experienced by a sector that increases or reduces productivity. This is the reason for the following method.

4.1.3 Shift-share method (SSM)

This method is the most common measure of structural transformation. It is a method of decomposing the participation of each sector in the overall growth of labor productivity into three separate terms. It is formulated as follows:

$\frac{\Delta P}{P^0} = \sum_{i=1}^{n} \frac{S_i^0 \Delta P_i}{P^0} + \sum_{i=1}^{n} \frac{P_i^0 \Delta S_i}{P^0} + \sum_{i=1}^{n} \frac{\Delta S_i \Delta P_i}{P^0}$ (5)

With: $\Delta S_i = S_i^T - S_i^0$ which respectively represent the change in employment and $\Delta P_i = P_i^T - P_i^0$ the change in productivity of the sector between the initial period 0 and the final period T. And P^0 represent the level at initial time of productivity labor. The level of productivity is calculated by the value added in constant prices divided by the number of workers. Equation (5) is composed of three parts:

i- $\sum_{i=1}^{n} \frac{S_i^0 \Delta P_i}{P^0}$ this term reflects the improvement in the sector's productivity. Since labor productivity is generally positive over time. This part is referred to in the literature as the "within effect" (within).

ii- $\sum_{i=1}^{n} \frac{P_i^0 \Delta S_i}{P^0}$ this term, called the static effect, is the contribution of the redistribution of employment between sectors, the static structural effect. This term is positive when employees are redistributed to sectors with higher-than-average productivity. When it is below average, the number is negative. It means that sectors with high productivity tend to attract more labor.

iii- $\sum_{i=1}^{n} \frac{\Delta S_i \Delta P_i}{P^0}$ the third term is the part that captures both the effect of employment reallocation and productivity growth. It is known as the dynamic structural effect. When both employment and productivity grow ($S_i^T - S_i^0 > 0$ and $P_i^T - P_i^0 > 0$), or both decrease ($S_i^T - S_i^0 < 0$ and $P_i^T - P_i^0 < 0$), the dynamic is positive. In another way, the dynamic is positive when workers move from a low-productivity sector to a more improved one, or these workers move from an improved sector to a low-productivity one. According to Timmer (2009) and Van Ark (1996), this part is called the cross-sectional term or the interaction term.

To understand the role of structural change, Vries (2013) argued the need to differentiate between static and dynamic effects. Indeed, this modeling is the method that decomposes aggregate labor productivity into the contribution of technological progress (within effect) and structural change (between effect). There is a problem with this index as productivity growth is independent of structural change in each sector.

4.1.4 Effective structural change index (ESCI)

Because of the problem that the Shift-share method (SSM) poses for measuring structural transformation, a new index called "Effective structural change index" has been proposed. According to Vu (2017), it is an index that combines the two previous indices. It is, the "Norm Absolute Value Index (NAVI)" and the "Shift-Share method (SSM)". The difference between the index (ESCI) and NAVI is that the former takes into account only those sectors that contribute positively to labor productivity. Thus, the fourth equation (4) will be rewritten as follows:

$ESCI = \frac{1}{2} \sum_{i \in \theta} \mid S_i^T - S_i^0 \mid$ with $\theta = \{i\}$ such that $\sigma_i > 0$ (6)

The θ represents in this equation, the set of sectors that contribute positively to labor productivity growth. The σ_i represents the total contribution of sector i to the overall productivity growth of the economy. In general, the $ESCI$ appears to be the best method for estimating structural transformation because it does not take into account sectors that are not conducive to overall productivity growth or to the growth of the economy (Andriansyah, 2020). What we can learn from this work is that the $ESCI$ allows us to study the overall contribution of productivity, whereas it should normally look at the two components "Within effect" and "Between effect" in isolation. This approach is relatively

more complex than the others and does not achieve the decomposition recognized in the literature for examining structural transformation. To assess the effects of Benin's structural transformation on economic growth, one must study the determinants. However, it would also be useful to make a comparison with the sub-region, specifically the countries of the West African Economic and Monetary Union (WAEMU). The second part of the modeling will take into account these countries: Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo. The three main economic sectors will be highlighted to calculate the structural transformation in each of these eight countries and we will retrieve the static and dynamic results to analyze the determinants of structural transformation on economic growth in this economic zone of Africa. The results of the structural changes within the WAEMU zone presented in the table in appendix n°3 show that Togo is the only country that recorded negative productivity growth between 2010 and 2019 (-2.34 percent). We note that Burkina Faso has made great strides in the last two decades. Through the movement of workers from agriculture to services and industries, there has been a profitable structural change. It is for this reason that the results of structural transformation, both intra- and inter-sectoral, have been more than 100 percent dynamic. Benin has experienced almost stable structural change over the two decades. Côte d'Ivoire and Senegal recorded a good transformation between 2000 and 2009, but it is weak within. While Guinea-Bissau shows a slight improvement in structural transformation, Mali has experienced a decline over the study period (see table in appendix n°3 and 4).

4.2   Model

Studies on structural transformation have been carried out in parallel with various themes (technical change and innovation, employment and immigration, industrial dynamics, institutions and politics, etc.). These studies have worked more on the convergence of these themes and the growth of the regional and urban economy (Silva, 2008). However, according to Krüger (2008), Silva (2008) and Dietrich (2012) these studies have not clarified the direction of causality between structural transformation and economic growth. For these authors, this direction may only be economic growth that causes structural change, or it may be the opposite, or it may be a simultaneous effect.

The model on which this work will rely in particular is the one used in the work of Morsy and Levy (2020) and Sanchez (2014), McMillan and Rodrik (2014) and Marouani (2016). The determinants of structural transformation were examined using the model of McMillan and Rodrik (2014). These authors used a panel of 40 countries from 1990 to 2010 of sectoral data of value added and employment by country. We will proceed in the same way using the equation (n°5) intra-sectoral structural change to assess the potential determinants that affect structural transformation. We will then consider the data on structural transformation for the eight (8) WAEMU countries over the period 2000 to 2019 for this estimation. Through a multivariate regression analysis, we will identify the main determinants of structural transformation among these countries. The explained variable (ST_t: Structural Transformation) is the structural transformation term at time t in country i, which is measured as structural change within or static. The econometric model is as follows:

$$ST_{i,t} = \beta_1 Agr_{i,t-1}/L_{i,t-1} + \beta_2 X_{i,t}^{raw}/X_{i,t} + \beta_3 \Delta(X_{i,t}+M_{i,t})/GDP_{i,t} + \beta_4 \Delta(FA_{i,t}+FL_{i,t})/GDP_{i,t} +$$
$$\beta_5 \Delta Credit_{i,t}/GDP_{i,t} + \beta_6 \Delta K_{i,t}/L_{i,t} + \beta_7 \Delta Educ_{i,t} + \beta_8 \Delta Inst_{i,t} + \beta_9 \Delta Prind_{i,t} + \alpha_i + \alpha_t + \varepsilon_{i,t}$$
(7)

4.3 Data

To implement the structural decomposition of Benin, six (6) economic sectors were selected for reasons of data availability. The data for these sectors comes from two sources, the World Development Indicator (WDI) and the International Monetary Fund (IMF). It should be noted that the literature often selects approximately ten sectors in six sectors whose data are available were selected for the analysis (see Appendix Table). Most of these data cover the period from 1990 to 2019 but all the data will be taken into account in the calculation of the structural transformation from 2000 onwards.

Table 5 Different variables of model.

	Symbol	Signification	Theoretical references
Dependent variable	$ST_{i,t}$	Value of structural transformation specifically (within/static) in country i in year t (ST)	McMillan et al. (2014) Morsy et Levy (2020)
Independent variables	$Agr_{i,t-1}/L_{i,t-1}$	Initial share of agriculture in the total employment (AgI)	Maddison (2001)
	$X_{it}^{raw}/X_{i,t}$	Share of raw material exports in total exports (XrX2)	Morsy et Levy (2020)
	$(X_{i,t} + M_{i,t})/GDP_{i,t}$	Change in trade openness of the country: the ratio of imports and exports to GDP. (VTrd)	Uy, Yi et Zhang (2013) Morsy et Levy (2020)
	$(FA_{i,t} + FL_{i,t})/GDP_{i,t}$	Change in financial openness: ratio of foreign assets and liabilities to GDP (VF).	Morsy et Levy (2020)
	$Credit_{i,t}/GDP_{i,t}$	Change in private sector credit to GDP ratio (VCrg)	Morsy et Levy (2020)
	$K_{i,t}/L_{i,t}$	Change in capital per worker (VKl)	Morsy et Levy (2020)
	$Educ_{i,t}$	Change in the number of years of schooling (VEd)	Morsy et Levy (2020)
	$Inst_{i,t}$	Change of institutional management level: an index calculated by the EPIN (VInst).	Rodrik (2007)
	$Prind_{i,t}$	Change of Producer Price Index (VPind)	Morsy et Levy (2020)

Source: Author

Chapter 5

Empirical results

5.1 Structural decomposition in Benin with disaggregate data.

The structural transformation in the various economic activities in Benin over the last two decades reveals that the change within has been more beneficial to labor productivity. Between 2016 and 2019, productivity in agriculture almost tripled its value obtained between 2001 and 2015. From the results obtained, it has been noticed that the current president has a strong interest in the agricultural sector. It is further proven from the policy of provision of agricultural inputs to farmers especially in the north. In the static and dynamic change, agriculture has only recorded losses. Unlike agriculture, construction and manufacturing negatively impacted labor productivity in the first decade of the study. However, between 2011 and 2019, these sectors positively improved labor productivity. As for trade, finance, and transportation, between the years 2001 and 2005 the contributions were negative. However, between 2006 and 2019, these sectors added value to labor productivity in Benin.

Table 6 Structural transformation in different sectors in Benin.

	Within						
	Agriculture	Constructions	Manufacturing	Trade	Finance	Transport	Total
2001-2005	1.924	-0.052	-0.496	0.519	0.194	5.031	7.120
2006-2010	1.362	-2.942	-0.119	1.613	0.752	5.108	5.773
2011-2015	4.310	2.758	2.849	3.521	1.949	3.029	18.416
2016-2019	17.883	1.809	5.626	13.318	4.967	4.644	48.248
	Static						
	Agriculture	Constructions	Manufacturing	Trade	Finance	Transport	Total
2001-2005	-0.831	-0.505	0.035	-9.161	-2.538	-0.860	-13.860
2006-2010	-1.051	-0.683	-3.877	11.656	6.989	7.307	20.341
2011-2015	-1.497	-0.113	-1.656	9.539	4.847	7.580	18.699
2016-2019	-1.586	0.030	-0.077	4.694	-2.010	-5.991	-4.940
	Dynamic						
	Agriculture	Constructions	Manufacturing	Trade	Finance	Transport	Total
2001-2005	-0.095	0.001	-0.001	-0.099	-0.027	-0.322	-0.543
2006-2010	-0.054	0.090	0.029	0.473	0.283	2.548	3.369
2011-2015	-0.250	-0.018	-0.412	0.711	0.361	1.019	1.411
2016-2019	-0.199	0.003	-0.004	0.450	-0.193	1.135	1.192

Source: Author based on data from WDI

5.2 Structural decomposition in Benin and comparator countries in West Africa

The descriptive analysis of structural transformation averages 0.41% and 3.68% for within and static change respectively over the 19 years. The minimum value of the within structural transformation is recorded in Côte d'Ivoire between 2006 and 2010. While the minimum value of the static transformation is recorded in Togo between the years 2012 and 2015. The maximum values for within and static transformation are recorded in Benin (2011-2015) and Côte d'Ivoire (2011-2015), respectively. Of the three sectors considered, the agriculture sector is the one that has not really favored structural transformation in Guinea-Bissau over the past fifteen years. Between 2001 and 2019, Guinea-Bissau recorded a 1.75% decline in labor productivity in the agricultural sector. Guinea-Bissau remains the only country in the WAEMU that does not benefit from structural changes in agriculture. Côte d'Ivoire recorded 12.24% labor productivity growth in the agricultural sector, followed by Benin (6.95%) and Niger (4.50%). The two dependent variables are defined by ST1 and ST2 respectively the within and static structural transformations.

Table 7 Descriptive Statistics.

Variables	Obs	Mean	Std. Dev	Min	Max
ST1	32	0. 4121	0.798	-0.0628	3.2997
ST2	32	3.6888	6.3749	-6.2891	26.0112
Agl	24	12. 4088	0.5121	11.6858	13.4264
XrX2	32	-25.5078	1.463	-28.139	-22.4083
VTrd	24	0.0161	0.1043	-0.2107	0.2152
VF	24	0.8075	1.6345	-2.6923	3.869
VCrg	24	0.042	0.0316	0.0393	0.1497
VKl	21	10.5627	1.4119	7.9054	12.844
VEd	24	0.2897	0.1761	0.0199	0.6
VInst	24	-0.0041	0.2038	-0.38	0.46
VPind	24	10.205	5.2278	0.7419	20.9324

Source: Author based on data from WDI

Industry declined by 0.10% in Togo between 2001 and 2019 and remains the only country that has not benefited from structural change in the industrial sector. Côte d'Ivoire experienced a structural transformation of 14.39% as the country benefited from industrial structural transformation; behind are Niger (2.52%) and Senegal (2.42%). The services sector negatively affected structural change by less than 2.87% while Côte d'Ivoire is the country that really benefited from the change in this sector. Over the 19 years, Côte d'Ivoire experienced a positive change of 32.18% in favor of the services sector. Behind this country are Benin (9.61%) and Guinea-Bissau (8.31%). Among all WAEMU countries, Burkina Faso employs more labor in the services and industry sectors than the others. This means that the structural shift from less productive sectors (agriculture) to more productive sectors (services and industry) has been successful for this country, even if the changes have been uneven

The opening of the economic system to the outside world can contribute to the financing of new technologies and in turn increase the production of enterprises, ultimately making them more efficient. The adoption of new production technology in the different economic sectors serves as a transmission channel for advanced organizations and therefore promotes structural transformation. The total output of agriculture divided by the employment of this sector explains the share of agricultural productivity. The results generally show that the share of agriculture to employees is positively correlated with structural change, which confirms the unavoidable weight in structural components. The change in trade openness is quite sensitive to the specifications. It positively and significantly affects the structural

Table 8 Correlation between within structural change and independent variables.

	ST1	Agl	XrX2	VTdr	VF	VCrg	VKl	VEd	VInst	VPind
ST1	1.000									
Agl	0. 197	1.000								
XrX2	0.471	-0.430	1.000							
VTdr	0.230	-0.456	0.211	1.000						
VF	-0.169	0.180	0.014	-0.026	1.000					
VCrg	-0.069	-0.244	0.058	0.363	0.425	1.000				
VKl	0.002	0.479	-0.626	-0.183	-0.164	-0.194	1.000			
VEd	-0.082	0.659	-0.424	-0.417	-0.093	-0.524	0.539	1.000		
VInst	-0.145	0.446	-0.385	-0.288	0.133	0.122	0.507	0.310	1.000	
VPind	-0.043	-0.131	0.241	0.225	-0.194	-0.020	-0.343	-0.035	-0.178	1.000

Source: Author based on data from WDI

Table 9 Correlation between static structural change and independent variables.

	ST2	Agl	XrX2	VTdr	VF	VCrg	VKl	VEd	VInst	VPind
ST2	1.000									
Agl	0.348	1.000								
XrX2	-0.503	-0.430	1.000							
VTdr	-0.048	-0.456	0.211	1.000						
VF	-0.086	0.180	0.014	-0.026	1.000					
VCrg	-0.390	-0.244	0.058	0.363	0.425	1.000				
VKl	0.281	0.479	-0.626	-0.183	-0.164	-0.194	1.000			
VEd	0.584	0.659	-0.424	-0.417	-0.093	-0.524	0.539	1.000		
VInst	0.316	0.446	-0.385	-0.288	0.133	0.122	0.507	0.310	1.000	
VPind	0.156	-0.131	0.241	0.225	-0.194	-0.020	-0.343	-0.035	-0.178	1.000

Source: Author based on data from WDI

Table 10 Structural transformation (Within) determinants: OLS Method.

Structural transformation Within (ST1)	(9.11)	(9.12)	(9.13)
Share of agriculture in the total employment (Ag1)	1.159*** (0.290)	1.360*** (0.336)	1.520*** (0.382)
Share of raw material exports in total exports (XrX2)	0.426*** (0.102)	0.415*** (0.104)	0.548*** (0.130)
Change in trade openness (VTdr)	2.977** (1.300)	2.712* (1.348)	3.182* (1.556)
Change in financial openness (VF)	-0.140* (0.076)	-0.152* (0.078)	-0.182* (0.096)
Number of years of schooling (VEd)		-0.847 (0.837)	-1.492 (1.293)
Level of institutional management (VInst)		-0.497 (0.692)	-0.718 (0.849)
Ratio private sector credit to GDP (VCrg)			0.863 (5.973)
Ratio change in capital per worker (VKl)			0.163 (0.157)
Producer Price Index (VPind)			-0.038 (0.029)
R-squared	0.6029	0.6358	0.7652
Number of observations	24	24	21
Number of countries	8	8	8

NB: Standard errors in parentheses, grouped at country level. GDP: gross domestic product.
OLS: ordinary least square. *p<10%, **p<5% and ***<1%

transformation term in the within direction and insignificantly in the static direction.

The table 12 presents the overall fixed and random effects specification results of the two models involved. In general, the regressions use the homogeneous regression estimate followed by the fixed and random effects model estimators accounted for individual heterogeneity at the country level. The homogeneous regression model presented in the model was used as a reference for the other regressions. The results show that the R-squared coefficients of determination for the pooled and random-effects models are all well above 20% in both study cases while the coefficients for the fixed-effects model are about 20% for the static transformation and much lower in the within case. This means that the explanations are potentially acceptable for the panel regressions. Furthermore, the discrimination test between the fixed-effects model and the Hausman random-effects model accepts the null hypothesis in favor of the random-effects model. This is justified by the fact that the Chi2 is greater than zero with its probability greater than 5%. Therefore,

Table 11 Structural transformation (Static) determinants: OLS Method.

Structural transformation static (ST2)	(10.21)	(10.22)	(10.23)
Share of agriculture in the total employment (Ag1)	3.596 (3.279)	-0.180 (3.366)	-1.367 (3.673)
Share of raw material exports in total exports (XrX2)	-1.858 (1.151)	-1.720 (1.042)	-3.095** (1.257)
Change in trade openness (VTdr)	11.296 (14.671)	18.077 (13.493)	26.903 (14.963)
Change in financial openness (VF)	-0.574 (0.863)	-0.258 (0.788)	0.375 (0.927)
Number of years of schooling (VEd)		20.496 (8.384)	20.005 (12.433)
Level of institutional management (VInst)		5.359 (6.927)	14.603 (8.168)
Ratio private sector credit to GDP (VCrg)			-103.117 (57.429)
Ratio change in capital per worker (VKl)			-2.224 (1.516)
Producer Price Index (VPind)			0.2004 (0.284)
R-squared	0.2520	0.4604	0.6884
Number of observations	24	24	21
Number of countries	8	8	8

NB: Standard errors in parentheses, grouped at country level. GDP: gross domestic product. OLS: ordinary least square. $*p<10\%$, $**p<5\%$ and $***<1\%$

Table 12 Panel specification with country fixed or random effects.

	Within (ST1)		Static (ST2)	
	Fixed effect	Random effect	Fixed effect	Random effect
Share of agriculture in the total employment (Ag1)	0.424 (0.744)	1.520*** (0.382)	-13.951 (9.755)	-1.367 (3.673)
Share of raw material exports in total exports (XrX2)	-0.031 (0.306)	0.548*** (0.130)	-6.724 (4.014)	-3.095** (1.257)
Change in trade openness (VTdr)	-0.019 (1.619)	3.182** (1.556)	2.132 (21.212)	26.903* (14.963)
Change in financial openness (VF)	-0.077 (0.115)	-0.182* (0.096)	1.930 (1.507)	0.375 (0.927)
Number of years of schooling (VEd)	-1.511 (1.911)	-1.492 (1.293)	-5.957 (25.034)	20.005 (12.433)
Level of institutional management (VInst)	-0.766 (1.228)	-0.718 (0.849)	4.627 (16.091)	14.603* (8.168)
Ratio private sector credit to GDP (VCrg)	-0.480 (8.160)	0.863 (5.973)	-179.224 (106.881)	-103.117 (57.429)
Ratio change in capital per worker (VKl)	0.185 (0.212)	0.163 (0.157)	0.053 (2.786)	-2.224 (1.516)
Producer Price Index (VPind)	0.030 (0.040)	-0.038 (0.029)	0.806 (0.526)	0.2004 (0.284)
R-squared	0.0704	0.7652	0.2226	0.6884
Hausman Test		3.54 [0.9393]		3.62 [0.9346]
Number of observations		21	21	21
Number of countries	8	8	8	8

NB: Standard errors in parentheses, grouped at country level and p-values in square brackets. GDP: gross domestic product. OLS: ordinary least square. *p<10%, **p<5% and ***<1%

we consider the random effects model to explain structural change through the implicit variables in the WAEMU zone.

These results show that there is a statistically significant positive effect of the share of agriculture in employment on transformation within confirming the result of Morsy and Levy (2020). This effect of agriculture's share of employment is negative and not significant on static processing. The share of raw materials in total exports has a positive effect on internal transformation and a negative effect on static transformation. As for trade openness, it has a positive and significant effect on internal and static transformation. The evolution of financial openness has a positive effect on static transformation, but its effect on internal transformation is negative and not significant. Apart from the level of

institutional management, which has a positive and significant effect on static transformation, the other variables, namely the number of years of schooling, credit allocated to the private sector, capital per worker and the producer price index, are not significant either on static transformation or on intra transformation.

This can be explained by the fact that countries hoping for a positive effect of structural change need to reduce employment in the agricultural sector with technological innovations to allow the service, manufacturing, and industrial sectors to employ abundant labor. The ratio of foreign assets and liabilities to GDP has a significantly negative impact on structural transformation in the WAEMU. This result indicates that structural transformation is not just a question of foreign assets and liabilities, but a question of reorganizing the productive system.

Structural transformation in Benin still remains a paradoxical phenomenon (Igue, 2019). The 2001 to 2005 period marking the last term of President Mathieu KEREKOU, experienced a positive intra-sectoral structural transformation (5.92%) while the inter-sectoral structural change remained negative. The trend in structural transformation is generally non-profitable to Benin's economic growth during this period (Static and Dynamic are -11.35% and -0.62% respectively). Comparing this period to the two following periods (2006-2010 and 2011-2015) with the leadership of President Boni YAYI, we observe that there has been a change in all structural transformation indices. The first term of this government change scored over all other periods. During this first term, this government effectively proceeded to several labor force improvement in almost all sectors of the country's economy. Massive recruitment in the administration, intervention in the agricultural, industrial and manufacturing sectors were all government actions to fight poverty in Benin. The best score for dynamic structural transformation was observed between 2006 and 2010 with a value of 3.50% due to the contribution of the service and industrial sectors. With regards to the last period marking the governance of new government, it is observed that between 2016 and 2019, the structural transformation experienced a slight decrease compared to the previous study period. Also, the Static structural transformation was negative. These results may be due to the new structural and administrative reforms implemented in the different sectors of the country. We hope that the second term will bring flourishing results in terms of the structural transformation of the Beninese economy.

The appearance of figure (1) makes it clear that there is a phenomenon that occurs each

time a government reaches the end of its term. During the last term of President Mathieu Kerekou in 2004 and 2005, GDP per capita fell before resuming its positive trend at the beginning of the reign of President Yayi Boni. The fall was relatively small towards the end of his first term in office in 2009 and 2010 before picking up again in an increasing manner between 2011 and 2014. The end of this second term also saw a decline in GDP per capita until 2016 when President Athanase Talon took power. During this first term of the current president, the growth in GDP per capita shows that there has been an improvement in the standard of living of the people in the country, which has earned Benin its new classification as a middle-income country. Indeed, there is every reason to believe that towards the end of each term of office, there is a slackening of socio-economic activities, perhaps giving way to political activities for elections. However, this was not observed in the first term of President Talon, the data will speak for itself in the years to come.

An analysis of Benin's three main economic sectors shows that agriculture continues to account for a large part of the workforce, although it contributes very little to the country's labor productivity. The service sector and the industrial sector are the sectors that bring opportunities and growth in developing countries. In Benin, these sectors have not yet been innovated to absorb the surplus of agricultural labor and the plethora of unemployment in the country. Industrial zones must be built in all the country's cities to increase domestic production and create jobs for young people, who in turn will be able to participate in the economic development of their country. After the important weight of services in productivity, the data show that the manufacturing, construction and trade sectors also play a crucial role in labor productivity. This is not surprising, since almost a quarter of the young population engages in these activities while seeking employment relentlessly. . It is not uncommon to meet young graduates working in the transport sector, with taxi cabs vehicles or motorcycles commonly called "ZEMIDJAN" as the public transport sector in Benin is also almost non-existent.

What are the challenges of structural policy to improve productive capacity in Benin:

⋆ the structural policy in Benin must succeed in shifting the economic structure towards high value-added activities;

⋆ it must lead to a plan with a higher knowledge content to ensure sustainable development;

⋆ the accumulation of human capital and natural and technological resources;

⋆ the innovation of the frameworks of structural transformations of the economy in which the public sector and the private sector will each play their role.

Development actors must feel comfortable to play their optimal roles. For this to happen, the government must facilitate the dynamism of markets for goods and services in terms of supply and demand. It should enable the private sectors to have an adequate and peaceful environment to explore new productions and new opportunities for domestic businesses, encourage local consumption and create a framework for synergy between all economic actors in both rural and urban areas.

Benin's financial system in the era of new technology must provide an inclusive environment for everyone through the policy of financial inclusion for all. While focusing on technology, there should be an opportunity to enable small and medium-sized enterprises to benefit from sufficient investment resources to open up markets for goods and services.

Chapter 6

Conclusion

Labor productivity between the traditional and modern economic sectors shows that in almost all economies there is a considerable gap in economic growth. The objective of this study was to examine the role of structural transformation and its causal relationship with economic growth in Benin and the WAEMU region. Two approaches were used in this scientific exercise. The first is based on the decomposition approach of Chapley (2008) and developed by (McMillan and Rodrik, 2014), Timmer et al. (2013), Haile (2018) and the second concerns the econometric analysis of the determinants of structural transformation based on the random effects estimation method Morsy and Levy (2020). The analysis covers the 8 countries of the monetary zone, namely Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo, and covers the period from 2001 to 2019. The results show that, apart from Togo where structural transformation is negative (-0.55%), all the other 7 WAEMU countries have experienced positive structural transformation, with Côte d'Ivoire in first place (19.60%), followed by Benin (4.45%) and Niger (2.61%). Static and within structural transformation have been much more stimulating for growth in all these countries, although this has been partially offset by a dynamic loss in Togo between the years 2011 and 2019. Nevertheless, structural transformation is still slow to have a significant and real impact on labor productivity in WAEMU countries in comparison to Asian countries. The policies implemented in the zone's abundant labor force are not yet producing the expected results. In terms of structural transformation in the WAEMU zone, our results show that there is a paradoxical evolution of structural change in these countries (to borrow the idea from **?**). At a time when Asian countries such as Indonesia, China, etc. are significantly reducing the share

of agriculture in total productivity, the opposite is observed in WAEMU countries such as Benin (Figure 3). Between 1980 and 2019, the share of labor employed in agriculture fell from 22.70% to 13.45% in Indonesia, while in Benin this share rose from 23.77% to 29.03%. In the industrial sector, the opposite phenomenon is observed. This means that the agricultural sector employs more labor than it needs, to the detriment of sectors that really need it. The more labor is available in the agricultural sector, the lower the productivity will be. This is justified by the fact that there is a considerable lack of industrial and service infrastructure to kick-start the economic development process. Furthermore, the dynamic panel model reveals that the share of agriculture in employment, the share of commodities in exports, and the change in trade openness are positively and significantly correlated with domestic structural change. The change in financial openness is negatively and significantly correlated with internal structural change. The level of management of institutions, the variation of the production price index and the number of school years in secondary school negatively correlate with the internal structural transformation but the result is not statistically significant. In contrast, static structural change is negatively correlated with the share of agriculture in employment and the share of commodities in exports. However, it remains positively and significantly correlated with trade openness and the level of institutional management in these countries. The composition of the structural transformation observed in the WAEMU zone, and in Benin in particular, contrasts sharply with that of the Asian countries. It should be noted that in Asian countries, intra-sectoral productivity gains are predominant, and dynamic structural change is the norm rather than the exception. Thus, in the economic production system of the WAEMU zone, most displaced agricultural workers move into low-productivity sectors such as trade and transport. From all the above, we can see that there is a need for an efficient system of industrial and energy technologies that could promote the development of sectors such as biotechnology, electronics and agri-food for the benefit of the general public and a large labor force. Also, private services and resources allocated to the populations are expected to be developed to promote financial inclusion to allow personal development. The tourism sector must be developed in new regions would constitute a stimulating factor for the creation of jobs in the hotel industry, retail services and also transportation.

Bibliography

Acemoglu, D., Aghion, P., and Zilibotti, F. (2006). Distance to frontier, selection, and economic growth. *Journal of the European Economic association*, 4(1):37–74.

Andriansyah, A. A. (2020). Structural change and regional economic growth in indonesia. *Munich Personal RePEc Archive*, pages 5–11.

Azonwadé, F. E., Gbaguidi, B., Paraïso, A., Dah-Nouvlessounon, D. M., Goubalan, E., Baba-Moussa, F., Amoussa, M., Lagnika, L., Dougnon, V., and Baba-Moussa, L. (2018). Polyphenolic profile, and antioxidant and antifungal activities of honey products in benin. *African Journal of Microbiology Research*, 12(1):9–18.

Baily, M. N. (1992). *Service Sector Productivity*. McKinsey & Company.

BASSE, G. A., ADEGNANDJOU, J., ISSIAKO, D., ABDOULAYE, A. R., and GIBIGAYE, M. (2021). Dynamique de l'occupation du sol dans le bassin supérieur de l'okpara et tendance evolutive à l'horizon 2060 au nord-benin. *International Journal of Progressive Sciences and Technologies*, 27(2):34–50.

Baumol, W. J. and Bowen, W. G. (1965). On the performing arts: The anatomy of their economic problems. *The American economic review*, 55(1/2):495–502.

Bosworth, B. and Collins, S. M. (2008). Accounting for growth: comparing china and india. *Journal of Economic Perspectives*, 22(1):45–66.

Boughton, D., Staatz, J. M., and Shaffer, J. D. (1994). Analyzing the impact of structural adjustment on commodity subsectors: Currency devaluation and the maize subsector in mali. Technical report.

Bourdet, D. (2002). *Well test analysis: the use of advanced interpretation models*. Elsevier.

Chen, C.-H. and Wu, H.-L. (2005). Determinants of regional growth disparity in china's transitional economy. *Journal of Economic Studies*.

Chenery, H. B. (1960). Patterns of industrial growth. *The American economic review*, 50(4):624–654.

Clark, C. et al. (1967). The conditions of economic progress. *The conditions of economic progress.*

De Vries, G., Timmer, M., and De Vries, K. (2015). Structural transformation in africa: Static gains, dynamic losses. *The Journal of Development Studies*, 51(6):674–688.

Dietrich, A. (2012). Does growth cause structural change, or is it the other way around? a dynamic panel data analysis for seven oecd countries. *Empirical economics*, 43(3):915–944.

Dunne, T., Haltiwanger, J., and Troske, K. R. (1997). Technology and jobs: secular changes and cyclical dynamics. In *Carnegie-Rochester Conference Series on Public Policy*, volume 46, pages 107–178. Elsevier.

Fabricant, S. (1942). Employment in manufacturing, 1899-1939. an analysis of its relation to the volume of production. fabr42-1.

Fisher, A. G. (1939). Production, primary, secondary and tertiary. *Economic record*, 15(1):24–38.

Galdar, B. K. (2019). Productivity growth in india since the 1980. *Economic Modelling*, 82.

Greenhalgh, C. and Gregory, M. (2001). Structural change and the emergence of the new service economy. *Oxford Bulletin of Economics and Statistics*, 63:629–646.

Griliches, Z. and Regev, H. (1995). Firm productivity in israeli industry 1979–1988. *Journal of econometrics*, 65(1):175–203.

Haile, G. F. (2018). Structural change in west africa: a tale of gain and loss. *World Bank Policy Research Working Paper*, (8336).

Haltiwanger, J., Foster, L., and Krizan, C. (2001). Aggregate productivity growth: Lessons from microeconomic evidence. *New Directions in Productivity Analysis*.

Hartwig, J. F. (2011). Regioselectivity of the borylation of alkanes and arenes. *Chemical Society Reviews*, 40(4):1992–2002.

Heger, M. P. and Neumayer, E. (2019). The impact of the indian ocean tsunami on aceh's long-term economic growth. *Journal of Development Economics*, 141:102365.

Igue, C. (2019). Conférence inaugurale sur "transformation structurelle de l'economie béninoise : Défis et opportunités.

Jose, A. (2019). Impact of labour productivity on structural transformation and economic growth: A state-level analysis. *Journal of Public Affairs*, 19(2):e1913.

Kaldor, N. (1966). Marginal productivity and the macro-economic theories of distribution: Comment on samuelson and modigliani. *The Review of Economic Studies*, 33(4):309–319.

Krüger, J. J. (2008). Productivity and structural change: a review of the literature. *Journal of Economic Surveys*, 22(2):330–363.

Kuznets, S. and Murphy, J. T. (1966). *Modern economic growth: Rate, structure, and spread*, volume 2. Yale University Press New Haven.

Lavopa, A. M. (2015). Structural transformation and economic development: can development traps be avoided?

Manning, C. (2000). Labour market adjustment to indonesia's economic crisis: context, trends and implications. *Bulletin of Indonesian Economic Studies*, 36(1):105–136.

Marouani, A. M. (2016). Contribution of structural change to productivity growth: Evidence from tunisia. *Journal of African Economies*, 25(1):110–132.

Matsuyama, K. (2009). Structural change in an interdependent world: A global view of manufacturing decline. *Journal of the European Economic Association*, 7(2-3):478–486.

McMillan, M. S. and Rodrik, D. (2011). Globalization, structural change and productivity growth. Technical report, National Bureau of Economic Research.

McMillan, M. S. and Rodrik, D. (2014). Globalization, structural change, and productivity growth, with an update on africa. Technical report, National Bureau of Economic Research.

Morsy, H. and Levy, A. (2020). Growing without changing: A tale of egypt's weak productivity growth. *African Development Review*, 32(3):271–287.

Rao, M. and Vidyattama, Y. (2017). The economic cost of violent conflict: the case of maluku province in indonesia. *Bulletin of Indonesian Economic Studies*, 53(3):281–308.

Report, I. C. (2013). West african economic and monetary union (waemu).

Rodrik, D. (2009). Industrial policy: don't ask why, ask how. *Middle East development journal*, 1(1):1–29.

Rodrik, D. (2013). Unconditional convergence in manufacturing. *The Quarterly Journal of Economics*, 128(1):165–204.

Russo Giovanni, C. G. (2001). Searching, hiring and labour market conditions. *Labour Economics*, 8(5):553–571.

Schumpeter, J. (1911). Theory of economic development. research on profit, credit, interest and the business cycle.

Silva, E. a. (2008). Structural change and economic dynamics 19. *Seminal contributions and a bibliometric account*, pages 273–300.

Solow, R. M. (1956). A contribution to the theory of economic growth.

Syrquin, M. (1988). Croissance économique changement structurel en colombie une comparaison internationale. *Revue Tiers Monde*, pages 481–492.

Timmer, M. P. (2009). A world without agriculture the structural transformation in historical perspective.

Timmer, M. P., Los, B., Stehrer, R., and De Vries, G. J. (2013). Fragmentation, incomes and jobs: an analysis of european competitiveness. *Economic policy*, 28(76):613–661.

Van Ark, B. (1996). 3 sectoral growth accounting and structural change in post-war. *Quantitative Aspects of post-war European Economic growth*, 1:84.

Vidyarthi, H. (2017). Banking outreach, infrastructure development and regional growth: Empirical evidence from indian states. *World Journal of Entrepreneurship, Management and Sustainable Development*.

Vries, K. de, R. G. G. J. d. V. M. P. T. (2013). The africa sector database: Sources and methods. *Mimeo Groningen Growth and Development Centre.*

Vu, K. M. (2017). Structural change and economic growth: Empirical evidence and policy insights from asian economies. *Structural Change and Economic Dynamics*, 41:64–77.

Wane, A. A. (2004). Growth and convergence in waemu countries.

Yu, C. and Démurger, S. (2002). Croissance de la productivité dans l'industrie manufacturière chinoise: Le rôle de l'investissement direct étranger. *Economie internationale*, (4):131–163.

Appendix

Table 13 The main agricultural products in Benin.

2018	Tons in million	Percentage
Cotton	0,76	6,61
Cassava	3,80	33,14
Yam	2,70	23,55
Corn	1,50	13,08
Palm oil	0,60	5,22
Rice	0,46	4,00
Pineapple	0,37	3,24
Sorghum	0,32	2,78
Tomatoes	0,25	2,21
Peanuts	0,23	1,96
Soy Bean	0,22	1,93
Cashew nut	0,22	1,88
Other (shea, oranges and coconut oil)	0,05	0,39
Total	11,47	100,00

Source: Author based on data from DGAE/Benin

Table 14 Variables symbols and their sources.

		Sources
$ST_{i,t}$	Structural transformation of country i in time t	Compute with WDI database
Agr^{t-1}	Agriculture	World Development Indicator
L^{t-1}	Employment	World Development Indicator
X^{raw}	Raw material exports	World Development Indicator
X^{chin}	Export around China	World Development Indicator
$X_{i,t}$	Export of country	World Development Indicator
$M_{i,t}$	Import of country	World Development Indicator
$GDP_{i,t}$	Gross domestic product	World Development Indicator
$FA_{i,t}$	Financial assets	IMF GFS, Main Aggregates & Balances, Budgetary Central Government, Other, Net Incurrence of Liabilities, Percent of GDP
$FL_{i,t}$	Financial liabilities	IMF
$Credit_{i,t}$	Credit to private sector	IMF
$K_{i,t}$	Capital	World Development Indicator
$Inst_{i,t}$	Institution	The level of institutional management: an index calculated by the European Policy Institutes Network (EPIN): Ranking of the collective average of public sector management and institutions by EPIN (1=low and 6=high)
$Prind_{i,t}$	Price Index	WHO GHED, Macro Data, Price Index, Gross Domestic Product (GDP) - Price Index, Index
$Educ_{i,t}$	Years of schooling over time	Source: UNESCO Institute for Statistics (2020), Barro and Lee (2018), ICF Macro Demographic and Health Surveys, UNICEF Multiple Indicator Cluster Surveys and OECD (2019b).
α_i	Country fixed effect	
α_t	Country temporare effect	
$\varepsilon_{i,t}$	Uncorrelated idiosyncratic error term	

Source : *Author based on data of WDI (2021 WB)*

Table 15 Decomposition of structural change by sector.

Countries	Years	Agriculture	Industry	Services	Total
Benin	2001-2005	1.0061	0.7503	1.7196	3.476
	2006-2010	1.3439	-0.9161	3.4225	3.8503
	2011-2015	1.4381	0.8646	4.3516	6.6543
	2016-2019	3.164	0.548	0.1169	3.8289
Burkina Faso	2001-2005	0.85348	0.44821	0.96363	2.26532
	2006-2010	0.1526	0.6426	1.2813	2.0765
	2011-2015	0.1351	0.6223	1.6779	2.4353
	2016-2019	0.1212	0.0503	1.4402	1.6117
Côte d'Ivoire	2001-2005	NA	NA	NA	NA
	2006-2010	6.804	6.945	11.314	25.063
	2011-2015	4.151	1.736	20.599	26.486
	2016-2019	1.287	5.709	0.268	7.264
Guinea-Bissau	2001-2005	0.351	0.275	-0.94	-0.314
	2006-2010	-1.041	0.583	3.89	3.432
	2011-2015	-0.923	0.52	4.454	4.051
	2016-2019	-0.145	0.54	0.912	1.307
Mali	2001-2005	1.234	1.659	1.478	4.371
	2006-2010	0.807	-0.57	2.332	2.569
	2011-2015	0.742	-0.548	0.561	0.755
	2016-2019	0.671	0.076	0.403	1.15
Niger	2001-2005	0.914	0.138	0.44	1.492
	2006-2010	1.088	0.629	0.956	2.673
	2011-2015	0.902	1.394	2.184	4.48
	2016-2019	1.605	0.362	-0.166	1.801
Senegal	2001-2005	0.102	0.508	1.382	1.992
	2006-2010	1.004	0.443	1.754	3.201
	2011-2015	0.166	0.885	0.355	1.406
	2016-2019	0.847	0.587	1.282	2.716
Togo	2001-2005	0.231	0.152	-1.84	-1.457
	2006-2010	-1.571	2.471	3.08	3.98
	2011-2015	1.098	-1.793	-5.657	-6.352
	2016-2019	1.019	-0.934	1.541	1.626

Source: Author based on data from WDI

Table 16 Decomposition of structural change.

Country	Years	Total(%)	Within(%)	Structural (Between)(%)	
				Static	Dynamic
Benin	2001-2005	3.4763	1.7294	1.7381	0.0087
	2006-2010	3.8503	1.9019	1.9251	0.0232
	2011-2015	6.6541	3.2997	3.3270	0.0273
	2016-2019	3.8294	1.8874	1.9147	0.0273
Burkina Faso	2001-2005	2.2652	1.0160	1.2492	0.0000
	2006-2010	2.0772	0.8627	1.2145	0.0000
	2011-2015	2.4356	1.2212	1.2143	0.0000
	2016-2019	1.6114	0.9147	0.6967	0.0000
Côte d'Ivoire	2001-2005	NA	NA	NA	NA
	2006-2010	25.0606	0.0031	25.0197	0.0378
	2011-2015	26.4882	0.0520	26.0112	0.4250
	2016-2019	7.2628	0.0179	7.1778	0.0670
Guinea Bissau	2001-2005	-0.3152	0.0025	-0.3091	-0.0085
	2006-2010	3.4318	0.0039	3.3576	0.0702
	2011-2015	4.0528	0.0050	3.8477	0.2000
	2016-2019	1.3069	0.0074	1.2835	0.0160
Mali	2001-2005	4.3724	0.0415	4.3099	0.0210
	2006-2010	2.5694	0.0226	2.5122	0.0347
	2011-2015	0.7543	0.0054	0.7780	-0.0291
	2016-2019	1.1511	0.0176	1.4185	-0.2849
Niger	2001-2005	1.4919	0.0148	1.4756	0.0016
	2006-2010	2.6747	0.0265	2.6501	-0.0018
	2011-2015	4.4795	0.0441	4.4063	0.0291
	2016-2019	1.8006	0.0180	1.7956	-0.0129
Senegal	2001-2005	1.9922	0.0196	1.9559	0.0167
	2006-2010	3.2013	0.0316	3.1602	0.0095
	2011-2015	1.4062	0.0139	1.3923	0.0000
	2016-2019	2.7154	0.0269	2.6914	-0.0030
Togo	2001-2005	-1.4573	-0.0146	-1.4594	0.0167
	2006-2010	3.9800	0.0393	3.9311	0.0095
	2011-2015	-6.3520	-0.0629	-6.2891	0.0000
	2016-2019	1.6257	0.0161	1.6125	-0.0030

Source: Author based on data from WDI

Table 17 Decomposition detailed of structural change by sector.

Country	Years	WITHIN (%)			STATIC (%)			DYNAMIC (%)		
		Agriculture	Industry	Services	Agriculture	Industry	Services	Agriculture	Industry	Services
Benin	2001-2005	0.507	0.377	0.845	0.5033	0.3751	0.8598	-0.0042	-0.0018	0.0148
	2006-2010	0.679	-0.461	1.684	0.6718	-0.4580	1.7113	-0.0069	0.0029	0.0272
	2011-2015	0.730	0.435	2.135	0.7191	0.4322	2.1757	-0.0110	-0.0026	0.0409
	2016-2019	1.569	0.264	0.054	1.5821	0.2740	0.0586	0.0129	0.0100	0.0043
Burkina Faso	2001-2005	0.584	0.097	0.335	0.2695	0.3512	0.6286	-0.00002	0.00001	0.00003
	2006-2010	0.079	0.223	0.560	0.0736	0.4196	0.7213	0.0000	0.0000	0.0000
	2011-2015	0.073	0.282	0.866	0.0621	0.3403	0.8119	0.0000	0.0000	0.0000
	2016-2019	0.054	0.024	0.837	0.0672	0.0263	0.6032	0.0000	0.0000	0.0000
Cote d'Ivoire	2001-2005	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2006-2010	-0.007	-0.002	0.013	6.881	7.001	11.138	-0.070	-0.054	0.163
	2011-2015	0.008	0.003	0.040	4.204	1.661	20.146	-0.061	0.072	0.413
	2016-2019	0.003	0.014	0.001	1.314	5.600	0.264	-0.030	0.095	0.003
Guinea-Bissau	2001-2005	-0.001	-0.002	0.006	0.355	0.283	-0.947	-0.003	-0.006	0.001
	2006-2010	-0.002	-0.001	0.007	-1.044	0.582	3.820	0.005	0.002	0.063
	2011-2015	-0.003	-0.001	0.008	-0.901	0.523	4.225	-0.019	-0.002	0.221
	2016-2019	-0.003	0.000	0.011	-0.143	0.542	0.884	0.001	-0.002	0.017
Mali	2001-2005	0.012	0.016	0.013	1.236	1.633	1.440	-0.014	0.010	0.025
	2006-2010	0.008	-0.006	0.020	0.803	-0.564	2.273	-0.004	0.000	0.039
	2011-2015	0.008	-0.005	0.003	0.791	-0.543	0.530	-0.057	0.000	0.028
	2016-2019	0.008	0.004	0.005	0.672	0.358	0.388	-0.009	-0.286	0.010
Niger	2001-2005	0.009	0.001	0.004	0.909	0.139	0.428	-0.004	-0.002	0.008
	2006-2010	0.011	0.006	0.009	1.084	0.629	0.936	-0.007	-0.006	0.011
	2011-2015	0.009	0.014	0.021	0.901	1.383	2.123	-0.008	-0.003	0.040
	2016-2019	0.016	0.004	-0.002	1.595	0.362	-0.161	-0.006	-0.004	-0.003
Senegal	2001-2005	0.001	0.005	0.013	0.110	0.501	1.345	-0.009	0.002	0.024
	2006-2010	0.010	0.004	0.017	1.016	0.437	1.707	-0.022	0.002	0.030
	2011-2015	0.002	0.009	0.003	0.173	0.873	0.346	-0.009	0.003	0.006
	2016-2019	0.009	0.006	0.013	0.861	0.579	1.251	-0.023	0.002	0.018
Togo	2001-2005	0.002	0.001	-0.018	0.238	0.149	-1.846	-0.009	0.002	0.024
	2006-2010	-0.015	0.024	0.030	-1.534	2.445	3.020	-0.022	0.002	0.030
	2011-2015	0.011	-0.018	-0.056	1.096	-1.778	-5.607	-0.009	0.003	0.006
	2016-2019	0.010	-0.009	0.015	1.032	-0.927	1.508	-0.023	0.002	0.018

Source: Author based on data from WDI

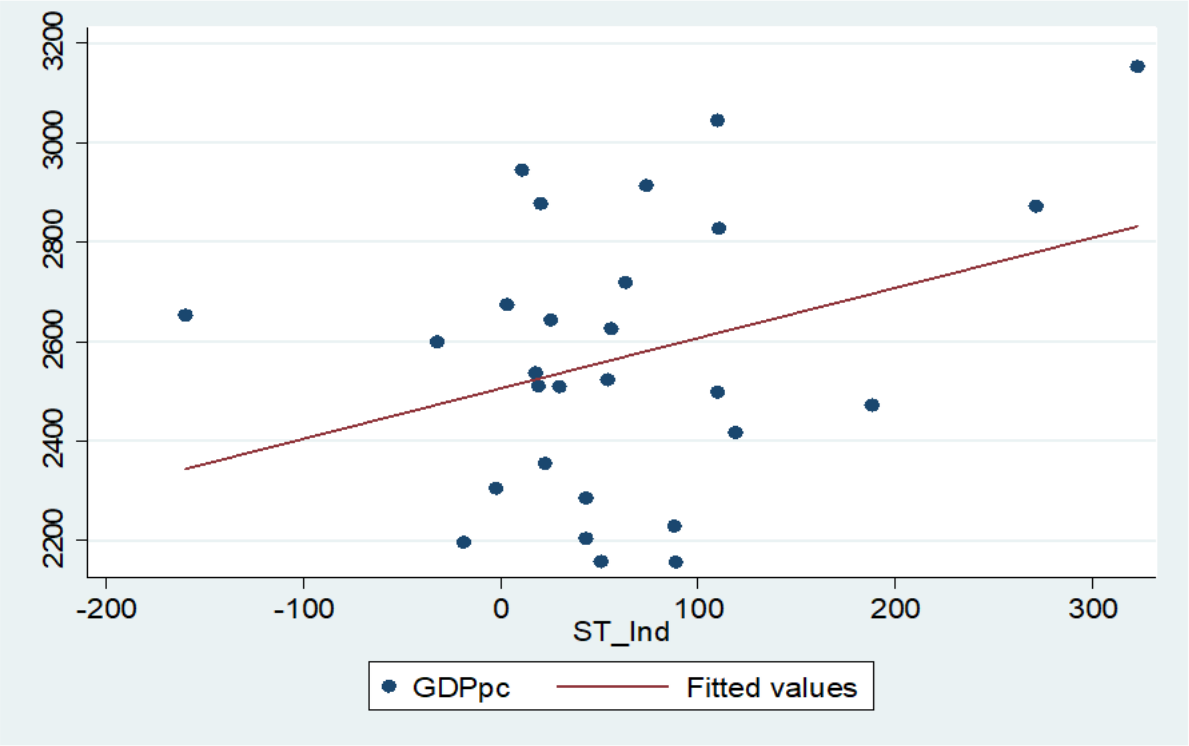Table 18 Correlation between GDP per capita and structural change in agriculture in Benin.

Table 19 Correlation between GDP per capita and structural change in agriculture in Benin.