

UNIVERSITÉ D'ORLÉANS

ÉCOLE DOCTORALE: Sciences de la Société Territoires, Économie,

Droit (SSTED)

LABORATOIRE D'ÉCONOMIE D'ORLÉANS

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soutenue le : **06 Février 2025**

pour obtenir le grade de : **Docteur de l'Université d'Orléans**

Discipline/ Spécialité : **Sciences Économiques**

**Assessing the Impact of Trade Liberalization on Unemployment,
Food Security, and Energy Poverty in Sub-Saharan Africa: A
Three-Essay Approach**

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A mes parents

Remerciements

Je tiens à exprimer toute ma reconnaissance à toutes les personnes ayant contribué à la réalisation de ce travail. Je suis reconnaissant envers mon Directeur de thèse, le Professeur Gervasio Semedo qui m’a enseigné depuis le master et m’a soutenu et encadré tout au long de la réalisation de cette thèse. Grâce à son expertise, ses conseils, ses encouragements et sa disponibilité, il m’a fait avancer dans la recherche. Je vous adresse mes plus sincères remerciements.

Je tiens également à remercier le Professeur Patrick Villieu, pour sa disponibilité, administrative et académique. Je remercie également la Professeure Camélia Turcu, responsable du Master International Economics pour sa disponibilité, ses encouragements et ses conseils. Un sincère merci au Professeur Windinkonté Seogo, du Centre universitaire de Kaya (Burkina Faso) pour sa disponibilité, ses conseils et ses relectures tout au long de cette thèse.

Un sincère merci aux Professeurs Relwendé Sawadogo et Maxime Menuet pour l’honneur qu’ils m’ont fait en étant rapporteurs de cette thèse ainsi qu’à tous les membres du jury de m’avoir fait l’honneur d’être dans mon jury de thèse. Je traduis ma reconnaissance aux responsables du LEO et à son responsable, le Professeur Christophe Hurlin pour leurs efforts dans la promotion de la recherche et pour l’opportunité qui m’a été offerte de m’inscrire et réaliser ma thèse. Je traduis également ma gratitude au personnel administratif du laboratoire, en particulier Mélie Henault pour son accompagnement. Un sincère merci à tous les professeurs du LEO pour leur présence lors des différents séminaires de recherche et leurs commentaires.

Je remercie également l’AERC pour leur soutien financier et académique et pour m’avoir donné l’occasion de participer à différents ateliers de recherche. Cela a contribué à améliorer ce travail. Je remercie mes collègues doctorants pour avoir contribué à l’amélioration de la qualité de ce document à travers leurs commentaires et suggestions.

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General Introduction

Conceptual Framework

The reduction of barriers to trade during the last decades around the world and the promotion of free trade has been the subject of much discussion among economists. The speech surrounding trade liberalization has been a central point of contention in global economic policy debates. Integration into the global economy has proven to be a powerful way for countries to promote economic growth, development, and poverty reduction. Trade has been a motor for growth since 1947 with the establishment of the General Agreement on Tariffs and Trade (GATT). Following the establishment of the GATT, several rounds of multilateral trade liberalization negotiations have been completed. The world trading system has benefited from that but also from unilateral and regional liberalization. Two of these rounds of negotiations (the “Uruguay round” completed in 1994 and the “Doha round” completed in 2008) led to the creation of the World Trade Organization (WTO) to help enhance the growing body of multilateral trade agreements. The WTO also resolves trade disputes which is one of its core activities through the Dispute Settlement Understanding (DSU). With one of the most active international dispute settlement mechanisms in the world, the WTO since 1995 has settled 623 disputes. The DSU has benefited developing countries. Many trade disputes against developed countries have been settled in their favour. We can mention for example the case of Brazil vs United States concerning cotton subsidies. In 2002 Brazil challenged certain agricultural subsidies provided by the United States to its cotton producers, alleging that they violated WTO rules and distorted global cotton trade. Brazil argued that these subsidies depressed global cotton prices, harming Brazilian cotton producers. The WTO ruled in favour of Brazil in 2014, finding that certain U.S. subsidies were inconsistent with WTO obligations. This case highlighted the ability of developing countries to challenge the agricultural policies of developed nations through the WTO dispute settlement system. We can also mention the case of Indonesia vs the European Union (EU). Indonesia challenged anti-dumping duties imposed by the EU on biodiesel imports from Indonesia. In 2014, Indonesia argued that the EU’s anti-dumping measures were inconsistent with WTO rules and unfairly targeted Indonesian biodiesel producers. The WTO panel ruled in favour of

Indonesia in 2018, finding that the EU had violated certain procedural requirements under the WTO Anti-Dumping Agreement.

Several developing countries in Asia and Latin America have made progress in term of integration, becoming successful and attracting foreign direct investment because of their participation in international trade. It is the case of China, India, Korea, and Singapore that have adopted trade liberalization and other reforms. However, the progress of integration has been uneven. We note a much slower progress for many other countries particularly in Africa and Middle East. Those countries share of world trade have declined substantially. This is a question that has fueled the debate between pro-traders and protectionists over the years. Theorists from both camps have influenced the policies of many countries at different stages of development. The early supporters of free trade praised the gains that countries could make from trade when they specialized in the production of goods in which they had a comparative advantage and engaged in trade to meet their other needs. The recent theorists argue that openness stimulates technological change by increasing national rivalry and competition, which encourages innovation; and that trade liberalization, by allowing new goods to circulate freely across national borders, increases the stock of knowledge for technological innovations that stimulate growth ([Mwaba, 2000](#)). Protectionist argued that trade liberalization was detrimental to growth and could lead to deterioration if adopted by developing economies. They have contributed to the development of strategies based on tariff and non-tariff barriers to trade, among others. Since the 1950s, the global economy has been characterized by major changes in the structure of international trade ([Maddison and OECD, 1989](#)) with an increase of the value of international trade. The rapid economic growth of East Asian and South Asian countries such as India and China due to gains generated by trade liberalization has motivated those in favour of trade liberalization ([Krueger, 1980](#)); (WTO, 2013¹). Those who criticize the idea of liberalization claim that the so-called profits are not distributed equally between and within countries (Krugman, 2002); ([Siddiqui, 2012](#); [Wade, 2005](#)).

Trade liberalization is the removal or reduction of barriers (recommended by international institutions such as the World Bank, the IMF, and the WTO) in the flow of goods and services across the border of economies/countries (Acharya, 2015). It is the removal of both tariff and non-tariff barriers. Tariff barriers include various forms of taxes or duties imposed on imported goods when they cross a country's border including duties and surcharges. It is a type of barrier a country uses to protect its domestic consumers and producers from foreign competition. Likewise, non-tariff barriers encompass a wide range of policies, regulations and practices that impede or restrict trade between countries without involving tariffs, including regulations and quotas. Non-tariff barriers restrict the import or export of products by means other than tariffs.

¹World Trade Organization. 2013. The Case for Open Trade

The goal of trade liberalization is free trade and the comparative advantage is usually considered as the theoretical justification. [Ricardo \(1927\)](#) pointed out that international trade obeys different rules from those of domestic trade. He points out that production may require a different amount of labour due to different circumstances, such as climate and other natural advantages. Ricardo assumed the production of two goods, for example cloth, and wine produced in two different countries for example in England and Portugal. Because of efficiency (in terms of lower unit costs), Portugal has an absolute advantage in the production of both goods. However, Ricardo suggests that Portugal is more efficient in relative terms in the production of a commodity and therefore has a comparative advantage in the production of that commodity. Given the international immobility of factors of production, gains from trade can be made based on this comparative advantage. Comparative advantage suggests that even if one country is less efficient than another in producing all goods, it can still benefit from trade by specializing in and exporting the goods in which it has a comparative productivity advantage, even if it has an absolute disadvantage in all goods. Ricardo found that it would be beneficial for both countries if they specialized according to their respective comparative advantage and began to trade with each other ([Chang 2008](#)). The Ricardian model was later modified in the Heckscher-Ohlin trade theorem which shows that differences in relative factor endowments are sufficient to create a basis for trade, even if there are no differences in the technological base and demand conditions. Their model highlights the importance of the interaction between the proportions in which various factors of production are available in different countries and the proportion they use to produce different goods, known as factor proportion theory. They also suggested that trade will lead to the equalization of factor prices between trading countries. The theorem of Heckscher-Ohlin states that a country has a comparative advantage in the production of goods which are intensive in the factor of production that is relatively more abundant, since such factor is relatively cheaper when compared to the price of the other factor, which is relatively scarce. Thus, countries in which capital supply is relatively large should concentrate on the production of capital-intensive goods, and vice-versa for countries whose labor supply is relatively large. Later, [Stolper and Samuelson \(1941\)](#) argued that an increase in the price of the commodity that a country exports leads to an increase in the real return to the relatively abundant factor and a decrease in the return to the scarce factor. They pointed out that the same relative price movements of the factors can increase the income of the owners of the abundant factor and negatively affect the owner of the scarce factor.

The idea that countries can benefit from trade is less controversial than almost any other idea in economics. The major impact expected of this liberalization is the increase of economic growth and the improvement of population's welfare ([IMF, 2001](#)). The process of dismantling

trade barriers and promoting open markets has been presented as a catalyst for economic growth, innovation, and international cooperation. It has become a refrain in policy circles that expanded trade holds the key to prosperity for developing countries ([Weisbrot and Baker, 2003](#)). According to the World Bank (2002): "A reduction in world barriers to trade could accelerate growth, provide stimulus to new forms of productivity-enhancing specialization, and lead to a more rapid pace of job creation and poverty reduction around the World".

Trade liberalization, through its promotion of international trade and investment, holds the potential to spur economic growth and foster development. Many studies over the years conclude that further trade liberalization will lead to increase in income, especially in developing countries. The World Bank, for instance, estimated that abolishing all trade barriers would increase global income by US\$ 2.8 trillion and lift 320 million people out of poverty by 2015 (World Bank, 2002). Proponents argue that increased market access and integration into global value chains can stimulate productivity, attract foreign direct investment, and create employment opportunities, thereby alleviating poverty and promoting shared prosperity. According to the IMF ², Over the last few decades, no country has achieved economic success, in terms of a substantial increase in its population's standard of living, without opening to the rest of the world. Trade openness and foreign direct investment has been an important factor in the economic success of East Asia, where the average import tariff has fallen from 30% to 10% over the last decades. This is also the case for India, Vietnam, and Uganda. The experience of the 1990s and 2000s shows that developing countries that globalized faster also grew faster than those that did not. Opening their economies to the global economy has been essential for many developing countries to develop competitive advantages in the manufacturing of certain products.

Empirical studies such as [Rodriguez and Rodrik \(2000\)](#) have highlighted the positive correlation between trade openness and economic growth in developing countries, underscoring the potential benefits of trade liberalization initiatives. A large body of literature have analysed the possible impacts of trade liberalization on socio-economic issues such as unemployment, economic growth, inequality, wages, poverty, etc... Authors like [Stolper and Samuelson \(1941\)](#), [Porto \(2008\)](#), [Dutt et al. \(2009\)](#) and more recently authors like [Jha and Rodriguez-Lopez \(2021\)](#) analysed the impact of trade liberalization on labor market and wages inequality and concluded that trade liberalization reduces unemployment and increases wages. Reducing barriers to trade in services can also boost the productivity of manufacturing firms. [Arnold et al. \(2011\)](#) show that allowing foreign firms to enter the services sector was the main channel through which services liberalization helped improve the performance of manufacturing sectors in the Czech Republic. In a related study, [Arnold et al. \(2016\)](#) examine the link between India's service sector reforms

²IMF (2001)

and the productivity of manufacturing firms, using panel data for around 4,000 Indian firms between 1993 and 2005. They find that reforms in the banking, telecommunications, insurance, and transport sectors have significantly increased the productivity of manufacturing.

However, the impact of trade liberalization on socio-economic outcomes is complex and multifaceted. Critics raise concerns about the vulnerability of domestic industries to foreign competition, the displacement of workers in vulnerable sectors, and the exacerbation of income inequality (Stiglitz and Walsh, 2006). Trade liberalization can also have adverse impacts especially on vulnerable populations as those in developing countries. Trade liberalization can for example exacerbate income inequality within countries by benefiting certain groups, such as wealthy individuals and multinational corporations, while disadvantaging low-skilled workers and small-scale producers. Trade liberalization may lead to job displacement in vulnerable sectors, downward pressure on wages, and a widening gap between the rich and the poor. More liberalization can also increase the dependency of developing countries on international markets for essential goods and services, making them vulnerable to external shocks and market fluctuations. Critics argue that reliance on imports for key necessities such as food, energy, and medicine can leave countries exposed to supply disruptions, price volatility, and geopolitical risks, undermining their economic sovereignty and resilience. Labor rights and working conditions can be undermined by trade liberalization particularly in countries with weak labor regulations and enforcement mechanisms. Critics argue that increased competition from imports, combined with pressure to reduce production costs, can lead to labor exploitation, unsafe working conditions, and violations of basic labor rights, such as the right to organize and bargain collectively. Moreover, the uneven distribution of gains from trade liberalization, coupled with structural constraints and institutional weaknesses, may limit its transformative potential, and perpetuate socio-economic disparities. While supporters of a more open trading system stress the positive economic effects of trade liberalisation, others emphasize its costs. In this sense, several authors have found a negative impact of trade liberalization on socio-economic issues such as unemployment and wages (Attanasio et al., 2004; Currie and Harrison, 1997; De Pinto and Michaelis, 2019; Revenga, 1997). The findings about the impact of trade liberalization diverge.

Concerning SSA, we have less studies analysing the impact of trade liberalization in the region. However, trade liberalization has been a significant aspect of the region's economic policy agenda over the past few decades, the goal being to promote economic growth, enhance competitiveness, and integrate into the global economy. Structural adjustment programs adopted in the 1980s and the 1990s by several Sub-Saharan African countries under the guidance of international financial institutions like the International Monetary Fund (IMF) and the

World Bank included trade liberalization measures such as tariff reductions. We also denote several regional economic communities including the Economic Community of West African States (ECOWAS), the East African Community (EAC), or the Southern African Development Community (SADC) with aim to pursue trade liberalization through the establishment of free trade areas, customs unions, and common markets and the reduction of intra-regional trade barriers. More recently, the creation of the African Continental Free Trade Area (AfCFTA) in 2018 established the world's largest free trade area by population (1.3 billion) and is an opportunity for countries members to use the increasing trade to lift growth and living standards across the continent. The implementation of the AfCFTA is expected to lead to a large reduction in tariff and non-tariff barriers to trade among African countries. It was signed by 44 countries in Rwanda on March 21, 2018. As of October 2019, 54 countries had signed the AfCFTA agreement.

Trade in the region has grown slowly in the recent decades with limited growth in merchandise trade. Despite undertaking trade liberalization reforms from most of the countries in the region have experienced slow or negative growth of exports of manufactured goods. In fact, in SSA, the pre-reform growth rate was higher, that is, 2.5 percent during the 1960–80 period, compared to the post-reform period, 1980–2000, when annual growth rates declined to 0.7 percent ([Shafaeddin, 2005](#)). For example, in Kenya, the trade liberalization attempt in the 1990s was hailed by the IMF and the World Bank as a good example for other developing countries to follow. The country adopted economic and trade liberalization, which coincided with increases in the price of electricity. This has made it difficult for manufacturers to continue production. The garment export sector employed more than 200,000 workers in the 1990s, but by the end of the decade, there were fewer than 35,000 ([Girdner and Siddiqui, 2008](#); [Otieno, 2006](#)). Recently, exports and imports of goods and services from SSA have grown rapidly over the past decade, but volumes are still low. Although Africa accounts for only a small proportion of world trade, the share of trade in the national income of most of the region's economies is significant compared with other regions. In 2019, the share of total exports in gross domestic product (GDP) was 30% in North America, 39% in South Asia, 53% in SSA and 58% in East Asia and the Pacific (World Bank, 2022). We then note the heavy dependence of the region's economy on international trade, which makes it more vulnerable to external shocks. SSA accounts for around 2% of world production and 3% of world trade in goods, as well as 3% of world trade in services (World Bank, 2022). We also note a small contribution of the manufacturing trade reflecting the fragmented landscape of trade policy on the continent and a global trading environment that has slowed the growth of non-agricultural trade on the continent and with the rest of the world. The composition of trade also denotes a low integration

in regional and global value chains. However, this situation supports the idea that policies to improve trade liberalization and trade environment can be beneficial to the increase of growth and then increases living standards in the region. Sub-Saharan African countries can expand and diversify their participation in international trade and global value chains. However, African governments face a dilemma when considering reducing tariff and non-tariff barriers as part of policies to promote international trade, while simultaneously addressing requirements for fiscal transition and structural development. On one hand, there is pressure to immediately reduce tariff and non-tariff barriers. Reducing these barriers is often seen to encourage trade, attract foreign investment, and stimulate economic growth. On the other hand, this reduction may also result in a loss of tariff revenues for governments. This reduction may also result in a loss of tariff revenues for governments. Sub-Saharan African countries face a lot of challenges and issues. The countries face infrastructure deficiencies such as inadequate transportation networks, ports, energy infrastructure, and telecommunications systems. This obviously impedes trade facilitation and increase the cost of doing business in SSA. Poor infrastructure hampers the movement of goods and services within and across borders, limiting trade competitiveness and export opportunities. Non-tariff barriers creating additional hurdles for exporters and importers should be addressed. The lack of institutional capacity and technical expertise to effectively implement and enforce trade policies, regulations, and standards. Strengthening institutional capacity and enhancing regulatory frameworks are critical for improving trade governance and reducing trade-related risks. Access to finance remains also a significant challenge for small and medium-sized enterprises (SMEs) in SSA. Limited access to credit, high borrowing costs, and inadequate financial infrastructure constrain investment in productive capacity, technology adoption, and export market development. Sub-Saharan African countries are also vulnerable to external shocks, including commodity price fluctuations, global economic downturns, and climate-related disasters. Dependence on primary commodity exports exposes the region to volatility in global commodity markets, undermining economic stability and growth prospects. However, the region is full of opportunities. It is a region rich in natural resources including minerals, oil, gas, and agricultural products. These resources present opportunities for export-led growth and foreign exchange earnings. With a population exceeding 1 billion people and a rising middle class, SSA offers a vast consumer market for goods and services. Increasing urbanization and changing consumer preferences are driving demand for a wide range of products, including consumer electronics, automobiles, and processed foods. The region then offers an interesting subject of study.

Context

The Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by the United Nations (UN) general assembly in September 2015. The SDGs build upon the Millennium Development Goals (MDGs) and provide a comprehensive framework for addressing the world's most pressing social, economic, and environmental challenges by 2030. The goals aim to end poverty, protect the planet, and ensure prosperity for all. However, several developing countries included those from the SSA region are not on track to meet these goals. Several crises such as conflicts, climate change and the persistent adverse effects of the COVID-19 are threatening the progress towards the SDGs. The world is still recovering for the COVID-19 slowly especially in SSA where the economies were severely impacted. The consequences of wars and conflicts in the region are also interrupting the progress towards the SDGs as well as the climate crisis.

In our dissertation, we focus on three SDGs: SGD8, SDG2 and SDG7. We choose to focus our analysis on these three SDGs because of their relevance for the SSA region. Also, because given its theoretical and empirical foundations, trade liberalization can have a significant impact on those issues for the region. The SDG8 (Decent work and economic growth) aim to promote full and productive employment with the specific target 8.5 aiming to achieve full and productive employment and decent work for all women and men by 2030 and the target 8.6 aiming to substantially reduce the proportion of youth not in employment. Unemployment is a topical issue in SSA with 34 million people unemployed in 2019 ([ILO, 2019](#)) and a regional unemployment rate of 6.8 % which is higher than the world average of 5 %. We also denote a higher women unemployment rate (7.5%) than for men (6.3%). Trade liberalization can affect unemployment. The well-known Heckscher–Ohlin and Stolper–Samuelson (HOS) theorems are the basis of discussions on the impact of trade liberalization on labor markets. For developing countries, the HOS model predicts an increase in demand labor due to openness. Another expected effect of trade liberalization is the indirect impact on the labor markets in developing countries. For [Stolper and Samuelson \(1941\)](#), an open trade regime could create more jobs in the formal sector, rise the demand for unskilled labor and then benefit workers by increasing their real wages.

The SDG2 (Zero hunger) seeks to end hunger, attain food security, enhance nutrition, and promote sustainable agriculture. The target 2.1 of SDG2 aims to end hunger by 2030 and guarantee year-round access for all individuals, particularly the poor and vulnerable, including infants, to safe, nutritious, and adequate food. Food security is also a topical issue in the region with more than one-third of the world's undernourished people located in Africa which represent 282 million in 2020 (46 million more than in 2019; [FAO, 2021](#)). Theoretically, trade can contribute for example to more production factors through its effects on prices. The producers

can also benefit from the increased demand for goods due to trade openness. Moreover, trade openness favors exports of products manufactured using a relatively abundant factor in most developing countries, namely (low-skilled) labour, thus creating employment opportunities (also for non-agricultural income) and increasing household incomes (Stolper-Samuelson theorem) (Dithmer and Abdulai, 2017). According to Jaffee et al. (2011), this process can lead to a reduction of poverty and an increase of food security. Trade openness can also lead to more access to food products through food aid. In fact, the openness of a country may positively affect the possibility to receive food aid (FAO, 2005).

The SDG7 (Affordable and clean energy) specifically aims to ensure access to affordable, reliable, sustainable, and modern energy for all. Energy poverty remains a topical issue in SSA. We denote low access to electricity and inefficient cooking system in the region. In 2021, 675 million of people still lived in the dark with 4 in 5 of them located in SSA. 567 million of people were without access in 2021. Theoretically speaking, according to the Heckscher-Ohlin model, reducing import tariffs can lower the cost of clean energy technologies, making them more accessible. In addition, the endogenous growth theory suggests that trade openness promotes innovation and technology transfer, leading to economic growth (Romer, 1990). This growth can provide the resources needed to improve energy infrastructure and access. The Stolper-Samuelson theorem supports this by showing that trade liberalization benefits the factor of abundance, which in many developing countries is labour (Stolper and Samuelson, 1941). Increased employment and income from trade can enable households to afford cleaner energy sources. The energy ladder hypothesis suggests that as household incomes rise, they move from traditional biomass fuels to modern energy sources, reducing energy poverty (Hosier and Dowd, 1987).

General Research Question

Given the clear relevance of those topical issues for the region, the general aim of the research is therefore to analyse the impact of trade liberalization on socio-economic issues in SSA. Specifically, it involves:

- Analysing the impact of trade liberalization on unemployment;
- Analysing the impact of trade liberalization on food security;
- Analysing the impact of trade liberalization on energy poverty.

This research defends the thesis that trade liberalization has a positive effect on the reduction

of unemployment, the increase of food security and the reduction of energy poverty. These issues are analysed in three essays. In each essay, each socio-economic issue is analysed individually.

Our thesis makes several contributions. With regard to the first essay, our work contributes to the research by assessing the impact of trade liberalization on the unemployment rate, with a special focus on youth and the difference between male and female unemployment rates in Sub-Saharan African countries, a region that has received less attention and usually a case study specific to one country. In the second paper, we provide new empirical evidence on the impact of trade liberalization on food security in SSA, focusing on trade in cereals. In fact, cereals, which are essential for food security especially in the SSA region, have not been the focus of papers analysing the impact of trade on food security. And with regard to the third paper, to the best of our knowledge, there are no empirical studies analysing the impact of trade liberalization on energy poverty in SSA. Our analysis then provides empirical evidence on the impact of trade liberalization on energy poverty in the region.

The Data

To analyse these questions, we use different time periods of study and different databases and countries based on the availability of data for the key variables. The data used in this thesis come from various sources such as the World Bank World Development indicator (WDI) database, the International Labor Organization (ILO), the Food and Agriculture Organization (FAO) statistics, the World Integrated Trade Solutions (WITS) database. Our thesis extends the empirical literature on trade liberalization in SSA which remains one of the least studied regions in the world. Our thesis also enhances the literature on topical issues namely the unemployment, food security and energy poverty in this region. The three essays are summarised as follows.

Outline

Essay 1

The first essay is called “Trade Liberalization’s Impact on Unemployment in Sub-Saharan African Countries.” In this essay we first analyse the overall impact of trade liberalization on unemployment rate. We then consider separately male unemployment and female unemployment rate. Finally, we test for the youth unemployment rate. Unemployment is one of the big economic challenges and an open trade regime could create more jobs in the formal sector, rise the demand for unskilled labor and then benefit workers by increasing their real wages. The well-known Heckscher–Ohlin and Stolper–Samuelson (HOS) theorems are the basis of discussions on the impact of trade liberalization on labor markets ([Stolper and Samuelson, 1941](#)). The theorem of Stolper–Samuelson then explains the effect of trade liberalization on the distribution

of income among production factors. It predicts that protectionism will increase the return of the scarce production factor (labor in developed countries and capital in developing countries). For developing countries, the HOS model predicts an increase in demand labor due to openness. The literature analysing the impact of trade liberalization on labor markets in Asia and Latin America developing countries is large. Several empirical studies analysed the impact of trade liberalization at the individual level in those developing countries ([Attanasio et al., 2004](#); [Menezes Filho and Muendler, 2007](#); [Porto, 2008](#)). Concerning African developing countries, the literature on this topic is less abundant. Less is known about all the effects of trade liberalization. We have a little evidence about the adjustment of labor market due to changes in trade regimes and policies, especially due to the poverty of data. Unemployment is one of the main economic problems. It refers to the people of working age who are without work, are available for work and seeking for it. The unemployment rate then reflects the inability of an economy to create jobs for people who want to work but do not, even if they are available for work and actively seeking work. In 2019, almost 34 million persons were unemployed in Africa (ILO, 2019). Africa also record a regional unemployment rate of 6.8 per cent which is higher than the world average of 5 %. This imply that unemployment is a key labor market issue in Africa. It is important to note that unemployment rate for women (7.5 %) is significantly higher than the one for men (6.3 %). We are focusing our analysis on Sub-Saharan African countries due to the high unemployment rate in this region. To do so, we use a database of 37 Sub-Saharan countries on the period 2000-2019. We apply a Generalized Method of Moments (GMM) to deal with endogeneity. We found that trade have a significant negative effect on unemployment rate. Secondly, by considering the gender and considering separately male unemployment and female unemployment, we found that trade still have a negative impact on both male and female unemployment with a greater impact on female unemployment. Regarding youth unemployment, we also noted a significant and negative effect of trade.

Essay 2

In the second essay entitled “ The impact of Cereal Trade on Food Security: Empirical Evidence from Sub-Saharan Africa,” the issue of food insecurity is treated. We analyse the impact of cereal import openness on the prevalence of undernourishment. Food insecurity is a global issue with between 720 and 811 million people worldwide faced hunger in 2020. The situation is more worrying in Africa where more than one-third of the world’s undernourished people, representing 282 million in 2020. Trade liberalization has been proposed as a potential solution to eradicate hunger and malnutrition. Trade can connect countries with comparative advantages in sectors such as agriculture, while consumers can access a broader range of nutritious foods.

Trade liberalization can also negatively impact food security in SSA. Indeed, it can lead to a dependence on imported food which can lead to higher prices for local consumers. This could also affect local small-scale farmers (depending on the policies design). We use a panel data of 27 Sub-Saharan African countries on the period 2000-2020. Several measures of trade liberalization exist but, in this essay, given the issue analysed, we use a very precise measure of liberalization that allow us to see the impact of trade on food security. We use a measure of cereal import openness. We choose to focus on cereals because cereals are the primary source of energy for more than 962 million people across SSA and are also essential to food security. We apply an instrumental variable (2SLS-IV) method and control for country and time fixed effect in this analysis to deal with endogeneity. We find that cereal import openness increases the prevalence of undernourishment in SSA and then increase food insecurity.

Essay 3

In the third essay entitled “Do Tariff reductions alleviate energy poverty? Evidence for Sub-Saharan African countries,” we address the problem of energy poverty. Energy poverty can be defined as the inability of households to meet their own energy needs. Trade liberalization can have a positive impact on energy poverty on the one hand by increasing the access to affordable energy sources, facilitate the import of energy products and then increase the availability of energy for households and industries. On the other hand, trade liberalization can have a reversal impact on energy poverty. Trade liberalization can create a dependence and an overreliance on imported energy making countries vulnerable to market fluctuations. Trade liberalization can also reduce energy subsidies and lead to higher energy prices for consumers. The determinants of energy poverty alleviation have starting to receive attention from economists and different factors explaining energy poverty have been analysed highlighting the income inequality, education, institutional quality, remittances, natural resources, financial inclusions and more. However, despite this growing literature on the determinants of energy poverty especially in developing countries, the role of trade liberalization is still less explored. Concerning SSA, to the best of our knowledge, there is no empirical work analysing the impact of trade liberalization on energy poverty. We then analyse the impact of trade liberalization on energy poverty alleviation in SSA. Tariff rates is used as the main measure of trade liberalization, a reduction in tariff rates meaning an increase of trade liberalization. We measure energy poverty by the access to clean fuels and modern technologies for cooking. In this study we use data for 20 Sub-Saharan African countries on the period 2000-2020 and apply a dynamic ordinary least square (DOLS), a fully modified ordinary least squares (FMOLS) and a canonical correlation regression (CCR) techniques to capture the long-run relationship. We find that tariffs rate reduction is associated

with an increase in the access to clean fuels and modern technologies for cooking in the long run helping alleviate energy poverty.

General Motivation

Sub-Saharan Africa (SSA) faces several development challenges. Among them first, rising conflict and violence in the region are having a dampening effect on economic activity, and climate shocks are set to exacerbate this fragility. Secondly, around 462 million people in the region were living in extreme poverty in 2023. The list is not exhaustive, so we can summarize that the problems are multi-thematic. The recent multi-crisis situation (climate-related problems, the COVID-19 pandemic), and the multiplication of conflicts has accelerated the increase in debt. Growth remains uneven across the continent. While East Africa is forecast to grow by 1.8% in 2023, West Africa is expected to grow by 3.3% this year. Overall, SSA's economic performance continues to be held back by the below-average performance of the continent's largest countries. Over the next three decades, the region will experience the fastest increase in working-age population of any region, with a projected net increase of 740 million people by 2050. Up to 12 million young people will enter the region's labour market each year over the coming decades, while only 3 million new formal salaried jobs are currently created each year. Unemployment is a pressing issue in the region. Food security is also a fundamental concern for the region, with millions of people facing hunger and malnutrition. At least one in five Africans goes to bed hungry and an estimated 140 million people in Africa face acute food insecurity, according to the Global Food Crisis Report 2022 - Mid-Year Update. The Horn of Africa is suffering from persistent drought, and countries dependent on Russia and Ukraine for wheat and sunflower oil imports have seen prices soar beyond the reach of ordinary people. Energy poverty remains a significant challenge in SSA, with a large proportion of the population lacking access to modern and reliable energy sources. Trade liberalization, through reducing trade barriers and promoting international trade, has the potential to stimulate economic growth and development. This thesis aims to contribute to the existing literature on the links between trade liberalization and socio-economic issues in SSA with a special focus on Sustainable Development Goals (SDGs) targets namely unemployment, food security and energy poverty.

Chapter 1

Trade Liberalization's Impact on Unemployment in Sub-Saharan African Countries

Abstract: In this essay, we analyze first the overall impact of trade liberalization on unemployment in Sub-Saharan Africa. Using the General Method of Moments (GMM) for 37 countries of the region over the period 2000 - 2019, we found that trade have a significant negative effect on unemployment rate. Secondly, by taking into account the gender and considering separately male unemployment and female unemployment, we found that trade still have a negative impact on both male and female unemployment with a greater impact on female unemployment. With regard to youth unemployment, we also noted a significant and negative effect of trade.

Keywords: Trade liberalization, Unemployment, Sub-Saharan Africa, Sustainable Development Goals

1.1 Introduction

The reduction of barriers to trade during the last decades around the world and the promotion of free trade has been the subject of much discussion among economists. The major impact expected of this liberalization is the increase of economic growth and the improvement of population's welfare (IMF, 2001).

While unemployment is one of the major economic challenges, trade economists are generally tended to abstract away from it because most trade models are full employment models with fully flexible wages (Dutt et al., 2009). But there does exist a small but growing literature on the relationship between trade and unemployment (Hasan et al., 2012). Another expected effect of trade liberalization is the indirect impact on the labor markets in developing countries. For Stolper and Samuelson (1941), an open trade regime could create more jobs in the formal sector, rise the demand for unskilled labor and then benefit workers by increasing their real wages. The well-known Heckscher–Ohlin and Stolper–Samuelson (HOS) theorems are the basis of discussions on the impact of trade liberalization on labor markets. The Heckscher–Ohlin theorem states that a country will have a comparative advantage in the production of goods that are intensive in the abundant production factor (capital or labor), this factor being cheaper. The theorem of Stolper–Samuelson then explains the effect of trade liberalization on the distribution of income among production factors. It predicts that protectionism will increase the return of the scarce production factor (labor in developed countries and capital in developing countries). For developing countries, the HOS model predicts an increase in demand labor due to openness. Then, we expect trade liberalization to affect positively the labor demand in developing countries.

The literature analyzing the impact of trade liberalization on labor markets in Asia and Latin America developing countries is large. Several empirical studies analyzed the impact of trade liberalization at the individual level in those developing countries. Attanasio et al. (2004), Menezes Filho and Muendler (2007), Porto (2008) analyzed the link between trade liberalization and unemployment in Columbia, Brazil and Argentina respectively. Attanasio et al. (2004) found that unemployment increased after liberalization and this increase was driven by non-traded sectors. Menezes Filho and Muendler (2007) found that Brazil's trade liberalization led to a transition to informal or self-employment for some workers, and to unemployment for others. Again, for Brazil, the work of Dix-Carneiro and Kovak (2017) on the effects of liberalization on labor markets is also noticeable. In the line of Menezes Filho and Muendler (2007), they found that import tariff cuts in Brazil lead to a decline in formal employment and a shift of displaced workers to the informal sector. Porto (2008) found for Argentina that an increase in exports products prices could lead to a lower unemployment rate and higher wages. Other developing countries such as India, China, Indonesia, Sri Lanka are widely analyzed (Goldberg and Pavcnik,

2007; Kis-Katos and Sparrow, 2015; Liyanaarachchi et al., 2016; Pavcnik, 2017; Topalova, 2010) found that a reduction in tariffs lead to a decrease of working adults in Indonesia.

Concerning African developing countries, the literature on this topic is less abundant. Less is known about all the effects of trade liberalization. We have a little evidence about the adjustment of labor market due to changes in trade regimes and policies, especially due to the poverty of data. However, we have few empirical studies that analyzed the impact of trade liberalization on labor market for some individual African developing countries. Then, Erten et al. (2019) analyzed the impact of trade liberalization on local labor market in South Africa. They found a decline in manufacturing employment. Njikam (2016) also analyzed how labor market adjust to trade liberalization in Cameroon and found that reforms boost the demand for unskilled jobs in several sectors such as textile and weaving, wood and furniture, paper and printing, rubber and plastic. McMillan and McCaig (2019) studied the effects of trade liberalization on labor markets in Botswana and found that a positive export demand shock is associated with a reduction in informal employment especially in the clothing industry. So empirically, there is no consensus among findings. To summarize the existing literature, for Asian and Latin America countries as well as for African countries, the results have been controversial.

Unemployment is one of the main economic problems. It refers to the people of working age who are without work, are available for work and seeking for it. The unemployment rate then reflects the inability of an economy to create jobs for people who want to work but do not, even if they are available for work and actively seeking work. In 2019, almost 34 million persons were unemployed in Africa (ILO, 2019). Africa also record a regional unemployment rate of 6.8 % which is higher than the world average of 5 %. This implies that unemployment is a key labor market issue in Africa. It is important to note that unemployment rate for women (7.5 %) is significantly higher than the one for men (6.3 %). We are focusing our analysis on Sub-Saharan African countries due to the high unemployment rate in this region. Concerning the youth people, Sub-Saharan Africa (SSA) have a great opportunity because of the young age of the population. Half of the population is under 25 years of age¹. And as the world's youngest region, improving employment opportunities for youth is important. So, Sub-Saharan African countries offer an interesting case of study because of the labor market issue. However, it is important to note that there is a category of countries in Africa that do not benefit from this demographic dividend. And for good reason, those countries are affected by civil wars, Ebola and HIV epidemics which mainly affect young people. Moreover, the Goal 8 (SDG8) of the sustainable development goals (Decent work and economic growth) aim to promote full and productive employment. The target 8.5 (full employment and decent work with equal pay) aims to achieve full and productive employment and decent work for all women and men by

¹Youth employment in Sub-Saharan Africa, Africa Development Forum - World Bank

2030. The target 8.6 (promote youth employment, education and training) aims to substantially reduce the proportion of youth not in employment. The reduction of unemployment and youth unemployment is then a topical issue. There is a need for rigorous empirical work investing the effects of trade on unemployment in SSA.

The main objective of this research is to analyze the impact of trade liberalization on unemployment rate in SSA. We detail the analysis by also taking into account the impact on men (male unemployment rate) and women (female unemployment rate). The impact of trade liberalization on youth unemployment is also examined. This study contributes to the research by assessing the impact of trade liberalization on unemployment rate, with a special focus on youth and the difference between men and women unemployment rate in Sub-Saharan African countries. As we said, the case of African countries have received less attention due to the poverty of data. Most of the studies are case studies specific to a country and for a specific time period. Our aim is to extend the study to a large panel of countries and a consequent time period. We try to overcome the problem of data, and apply a dynamic econometric approach as unemployment is dynamic phenomenon meaning that previous rate affects current rate. The remainder of the paper is organized as follows. Section 1.2 presents the literature review. Section 1.3 presents some stylized facts about unemployment in SSA. Section 1.4 describes the data used and the methodology. Section 1.5 discusses the empirical results. Section 1.6 presents some robustness check and section 1.7 concludes the paper.

1.2 Trade liberalization and labor market in the literature

Through its impact on economic growth, trade liberalization is expected to impact labor markets. The literature analyzing the impact of trade liberalization on labor markets is large. The theorem of Heckscher-Ohlin states that a country has a comparative advantage in the production of goods which are intensive in the factor of production that is relatively more abundant, since such factor is relatively cheaper when compared to the price of the other factor, which is relatively scarce. Thus, countries in which capital supply is relatively large should concentrate on the production of capital-intensive goods, and vice-versa for countries whose labor supply is relatively large. Then, the Heckscher-Ohlin states that trade is expected to reduce unemployment if the country is labor-abundant based on comparative advantage. We also note the model developed by [Davidson et al. \(1999\)](#) which add equilibrium job search to a model of international trade with sectors and countries. [Dutt et al. \(2009\)](#) also developed a theoretical model of trade and unemployment including differences in productivity and factor abundance in labor markets. They find that the effect of increasing trade on unemployment rate depend on the reason of trade. If trade is due to difference in productivity (Ricardian model of trade), trade liberalization

reduces unemployment rate. But if trade is due to factor abundance (Hecksher-Ohlin model of trade), trade liberalization will reduce unemployment in a labor-abundant country but is likely to increase unemployment in a labor-scarce country. We also have the model developed by [Helpman and Itskhoki \(2010\)](#) presenting two countries and two sectors. The two sectors produce differentiated goods and homogeneous goods each. They assume that there is no unemployment in the homogeneous goods sector and then, lowering trade barriers could increase unemployment rate by increasing the share of production in the country's differentiated products sector. This model has been extended by [Helpman et al. \(2010\)](#) by adding job-specific differences in worker ability. [Mitra and Ranjan \(2010\)](#) analyzed the effects of offshoring on a country's unemployment rate. Their model specify that offshoring reduces aggregate unemployment if there is perfect labor mobility between sectors. However, the effect on aggregate unemployment is ambiguous if there is limited labor mobility between sectors. Starting with this theoretical framework, the effects of trade liberalization on labor market have been largely debated among economists. However, developing countries have received less attention. The findings for those countries are mixed ([Erten et al., 2019](#); [Njikam, 2016](#)). Some studies have emphasized their analysis on the impact of trade liberalization on unemployment and wage analysis. Others have instead analyzed the impact of trade liberalization on the labor market dynamic meaning that the shifting from formal to informal sectors for workers. In this section, we first review the theoretical literature on trade and unemployment and then discuss the empirical literature.

1.2.1 Theoretical review

Four main models can be mentioned to analyze the impact of trade on unemployment ([Zaki, 2011](#)). We distinguish firstly the Ricardian model. In this model, each country exports the good for which it has a comparative advantage, defined by a relative autarky price lower than that of the other country. Trade, therefore, causes each country to increase its production of the good it exports, with labor being reallocated to that production from import-competing industry. This means that factors of production should shift to sectors that have a comparative advantage, resulting in the creation of jobs in those sectors and the destruction of jobs in other sectors. The net effect can be positive or negative in the short term, depending on the characteristics of the economy. However, in the long run, the efficiency gains caused by trade liberalization should lead to positive employment effects, as the country produces more efficiently ([Krugman and Obstfeld, 2009](#)).

Secondly, we have the HOS model where under free trade, countries export the goods that use the relatively abundant factor of production. Then, a capital-abundant country will export the capital-intensive good, while the labor-abundant country will export the labor-intensive good.

The Stolper-Samuelson theorem describes the relationship between changes in output prices (price of goods). According to the theorem, an increase in the relative price of a good for which the country has an advantage comparative advantage will lead to a more than proportional increase in the real returns of the factor that is used intensively in the production of this good, and conversely, to a decrease in the real returns of the other factor. Such effects hold when factors are assumed to be mobile between different sectors. However, the intersectoral mobility of production factors is relatively low in the short term.

Thirdly, we have the sector specific model discussed by [Viner \(1932\)](#). The model is designed to demonstrate the effects of trade in an economy in which one factor of production is specific to an industry. A move toward free trade raises the price of exportable goods and lowers the price of importable goods. As a result, returns of factors used in exporting sectors will increase, while factors used in importing sectors will see their income decline. In other words, when a factor of production, such as capital, is immobile between industries, a move towards free trade will result in a redistribution of income. Some individuals, such as owners of capital in the export industry, will benefit from free trade. Other individuals, the owners of capital in import-competing industries, will lose out. Also, according to this model, workers, who are freely mobile between industries, can win or lose because they are not forced to move. Therefore, the winners and losers of this model are distinguished by industry.

The fourth model of international trade theory holds that instead of having a reallocation of the factors of production between sectors, this reallocation will take place within each sector. Unproductive firms will leave the market, productive firms will serve the domestic market, and the most productive ones will be able to compete and export to foreign markets ([Krugman and Obstfeld, 2009](#)). Therefore, these models predict that, in all sectors, jobs are created by producers who are able to compete internationally and destroyed by those who are not. Looking at the gender decomposition, the HOS model states that women are likely to benefit from trade if countries start exporting goods or services that use intensive female labor. Furthermore, [Becker \(2010\)](#) argues that women should expect to benefit from trade regardless of the resulting export pattern, since trade leads to greater competition and therefore encourages women to be more active and therefore encourages companies to reduce the cost of discrimination by hiring more women.

Our work is close to the Ricardian prediction that unemployment and trade openness are negatively related. By also taking into account female unemployment, we join the prediction of the HOS model and [Becker \(2010\)](#) that women should benefit from trade. Then, we aim to improve the literature by providing empirical evidence for Sub-Saharan African countries where female unemployment is an issue and where labor supply is important.

1.2.2 Empirical review

1.2.2.1 Trade liberalization, unemployment and wage inequality

Several studies have analyzed the impact of trade liberalization on unemployment and wage inequality. The empirical results are mixed. On the one hand some authors found evidence that trade liberalization is associated with a reduction of unemployment and better wages. It's the case of [Stolper and Samuelson \(1941\)](#) who found that under more open trade regime, rising demand for unskilled labor could benefit poor workers by increasing their wages and create more jobs in the formal economy. More recently, [Porto \(2008\)](#) found for Argentina that an increase in exports products prices could lead to a lower unemployment rate and higher wages in the agriculture sector. [Dutt et al. \(2009\)](#) analyzed the link between international trade and unemployment. By using cross-country data, they found that unemployment and trade openness are negatively related. By using panel data, they found an unemployment increasing short-run impact of trade liberalization, followed by an unemployment reducing effect leading to the new steady state. [Jha and Rodriguez-Lopez \(2021\)](#) focused on the monopsony of the labor market. They found that when the monopsony power is high, trade liberalization provides additional welfare gain.

On the other hand, some authors found that trade liberalization is associated with an increase of unemployment and a worsening of wages inequality. Then, [Revenga \(1997\)](#) analyzed the impact of trade liberalization on employment and wages in the Mexican manufacturing sector. They found that trade liberalization has affected firm-level employment and wages by shifting down industry product and labor demand. Focusing their analysis on Morocco, [Currie and Harrison \(1997\)](#) found that trade reforms have an impact on employment. Firms were highly affected and denoted significant employment losses. [Attanasio et al. \(2004\)](#) found that unemployment increased after liberalization and this increase was driven by non-traded sectors in Columbia. [Edmonds and Pavcnik \(2005\)](#) analyzed how trade liberalization affects the employment of children in Vietnam using household-level data during the episode of rice market liberalization. They found that greater market integration can be associated with less child labor. Using a model of search unemployment, [Moore and Ranjan \(2005\)](#) analyzed the effects of globalization and skilled-biased technological change and found that both lead to an increase in wage inequality in the US. [De Pinto and Michaelis \(2019\)](#) take into account the effect of trade union heterogeneity. They found that union heterogeneity constitutes an unemployment/employment effect of trade liberalization. If the unions are powerful in the high-productivity firms, trade liberalization will increase unemployment. Otherwise, (powerful in the low-productivity firms) trade liberalization will decrease unemployment. [Davis and Harrigan \(2011\)](#) studied how labor markets adjust to trade liberalization and found that for reasonable

parameter values, as many as one-fourth jobs may be destroyed by liberalization. [Paz \(2014\)](#) examined the impact of trade liberalization on the labor markets in Brazil and found that a reduction in domestic import tariffs reduce the average formal wage. [Anwar and Sun \(2012\)](#) using firm level panel data analyzed the impact of trade liberalization on skilled-unskilled wage inequality in China’s manufacturing sector. They found that trade liberalization has contributed to an increase in wage inequality in this sector. [Mehta and Hasan \(2012\)](#) found that wage shifts attributable to trade liberalization account for 29% of the increase in inequality in India. When analyzing the impact of trade liberalization on labor markets, several specificities can be taken into account. It’s the case of [Cheong and Jung \(2021\)](#) which for their part focused their analysis on the heterogeneity within the same group of workers instead of workers characteristics like previous researches. Then, they found that the wages of unskilled workers in Korea have increased since its free trade agreements with advanced countries (EU, US).

Also, we have some studies that did not find evidence of an increase of unemployment or wage inequality. It’s the case of [Hasan et al. \(2012\)](#) which analyzed the impact of trade liberalization on unemployment in India using state and industry-level unemployment and trade protection data. They found no evidence of any increase of unemployment.

1.2.2.2 Trade liberalization and labor market dynamic

Trade liberalization can also affect the dynamic of the labor market by causing shift from formal to informal sector from workers. In this context, [Carneiro and Arbache \(2003\)](#) analyzed the impact of trade liberalization on labor market indicators in Brazil and found that trade liberalization higher labor demand and in contradiction with HOS theorems predictions, economic improvement tends to benefit to skilled workers. [Menezes Filho and Muendler \(2007\)](#) found that Brazil’s trade liberalization led to a transition to informal or self-employment for some workers, and to unemployment for others. In the same line with [Menezes Filho and Muendler \(2007\)](#), [Dix-Carneiro and Kovak \(2017\)](#) found that import tariff cuts in Brazil lead to a decline in formal employment and a shift of displaced workers to the informal sector. Trade liberalization also forces households to adapt. Therefore, [Dai et al. \(2021\)](#) have investigated how households adjust to labor markets shocks caused by import tariff liberalization in China. They found that households responded in several ways including less saving, more female and old household members started working and more young adults co-residing with parents. This was in response to the larger decline in wages due to larger tariff cuts. [McCaig and Pavcnik \(2018\)](#) analyzed the effects of the US – Vietnam bilateral trade agreement on labor allocation in Vietnam. This agreement led to some reductions in US tariffs on Vietnamese exports. They found that the share of manufacturing workers in the formal sector increased by 5 percentage

points due to tariffs reductions. [Topalova and Khandelwal \(2011\)](#) analyzed the link between changes in tariffs and firm productivity in India. They found that lower tariff on final goods tend to increase firm-level productivity. The effect was larger in import-competing industries and those not subject to excessive domestic regulation.

This variety in the results can be explained by the diversity of the methods used (CGE, OLS, 2SLS, probit, difference in difference, GMM, ...), the difference in the variables used, the specificity of certain analysis (child labor, monopsony of firms, trade union). Also, most of the different analysis are specific to a single country which imply specific labor force survey data.

1.2.2.3 The impact of trade liberalization in African developing countries

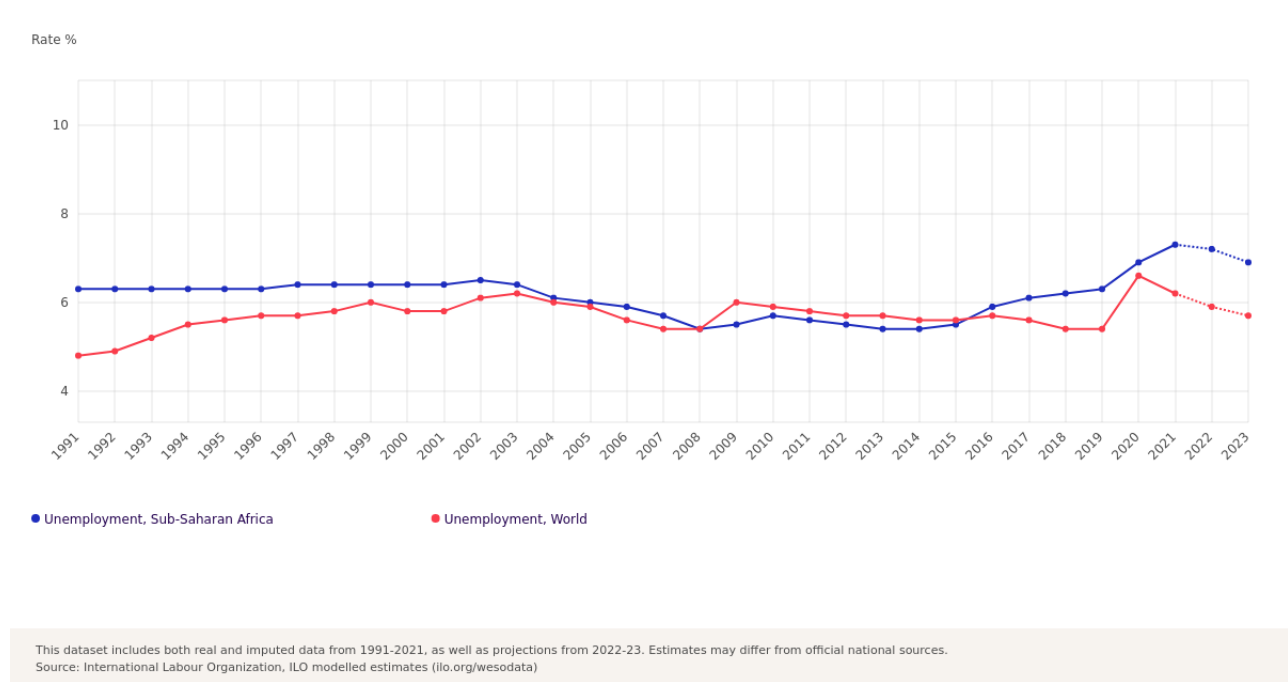
Concerning African countries, few studies have provided empirical evidences. Then, [Erten et al. \(2019\)](#) using a labor market approach analyzed the causal effects of tariffs reforms in South Africa. They found a decline in manufacturing employment. [Njikam \(2016\)](#) analyzed whether trade and labor market liberalization affect the demand for skilled and unskilled employment in manufacturing sector for Cameroon. They found that reforms boost the demand for unskilled jobs. [McMillan and McCaig \(2019\)](#) for their part studied the effects of trade liberalization on labor markets in Botswana. Using labor force surveys, they found that trade liberalization had effects within industries. They found an increase in the prevalence of working in an informal firm and self-employment. They also found a decrease in hours worked due to the movement of workers to informal firms. [Damoah \(2021\)](#) have focused their analysis on Ghana. They analyzed the impact of the accession to the World Trade Organization (WTO) on labor market. They found that the degree of monopsony power of manufacturing firms increased. Firms then compress real wages to offset loss of market power due to increased international competition. [Zaki \(2011\)](#) analyzed the nexus between trade, gender and employment in Egypt. He evaluated the impact of trade using a macroeconomic and a microeconomics approach. He found at the macroeconomic level that trade (exports) has a positive and significant effect on employment meaning a reduction of unemployment. And at the microeconomics level, trade increase the probability of working of females. [Anyanwu \(2014\)](#) analyzed empirically the impact of Africa's intra-regional trade on youth unemployment as well as the gender-specific impacts. He found that high levels of intra-African trade reduce the aggregate, as well as both male and female unemployment in Africa.

1.3 Stylized Facts

1.3.1 Unemployment trend in Sub-Saharan Africa

To begin with, some stylized facts about the unemployment rate in SSA are intuitive. The Figure 1.1 shows that the unemployment rate in Sub-Saharan African countries is higher than the world's unemployment rate for the period 1991-2023.

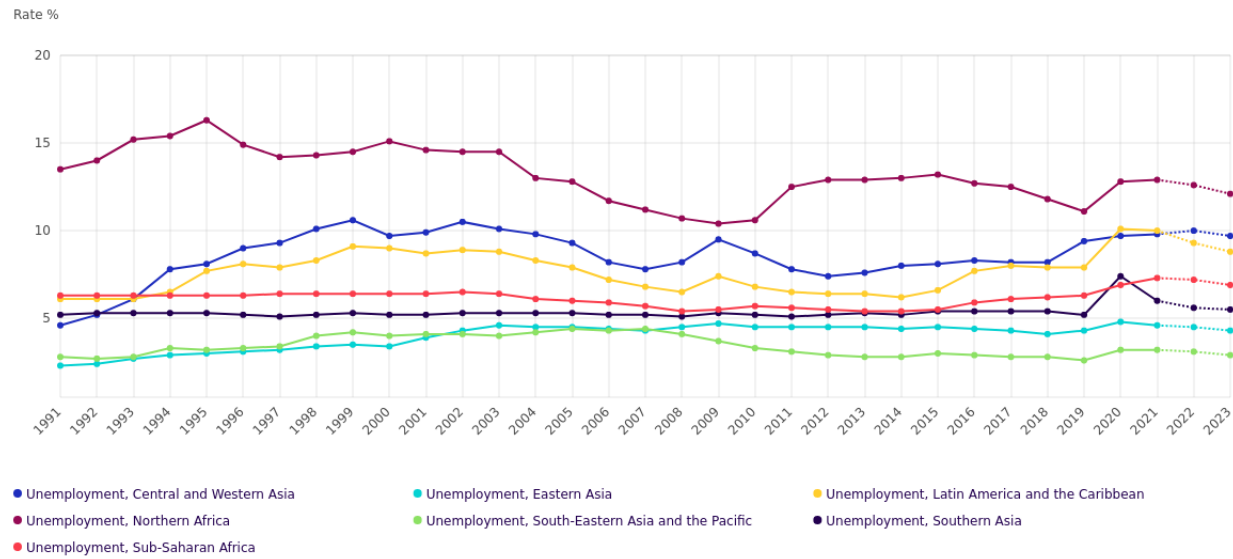
Figure 1.1: Unemployment rate Sub-Saharan Africa and World



Source: International Labor Organization

In comparison to other developing regions, we notice in the Figure 1.2 that unemployment rate in SSA is higher than in Southern Asia, Eastern Asia and South-Eastern Asia for the period 1991-2023.

Figure 1.2: Unemployment rate by regions

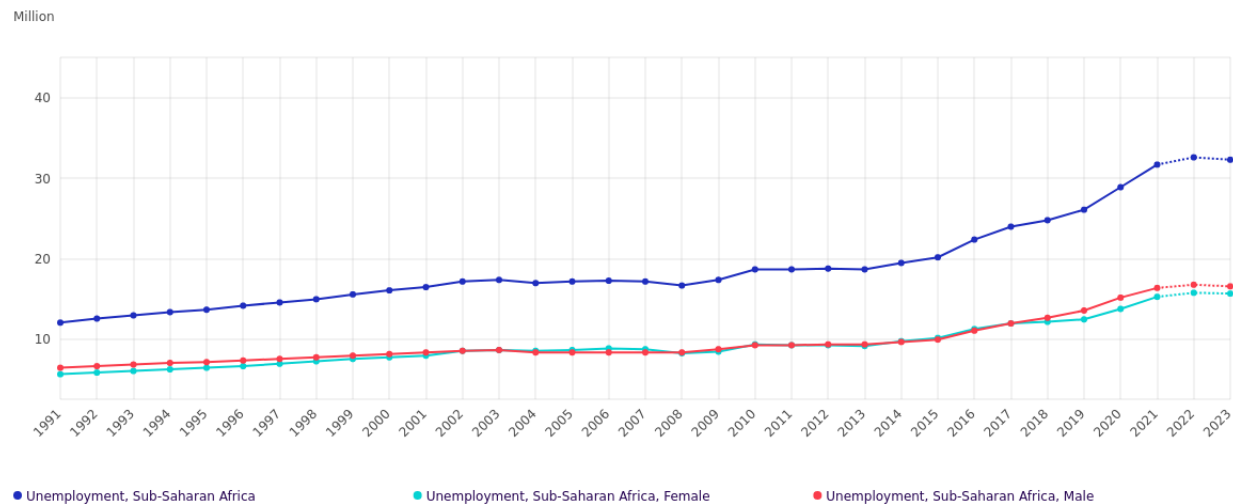


This dataset includes both real and imputed data from 1991-2021, as well as projections from 2022-23. Estimates may differ from official national sources.
Source: International Labour Organization, ILO modelled estimates (ilo.org/wesodata)

Source: International Labor Organization

By considering separately male and female unemployment rate, the Figure 1.3 allows us to confirm that female unemployment is more important in SSA for the period 1991-2023.

Figure 1.3: Unemployment rate by gender

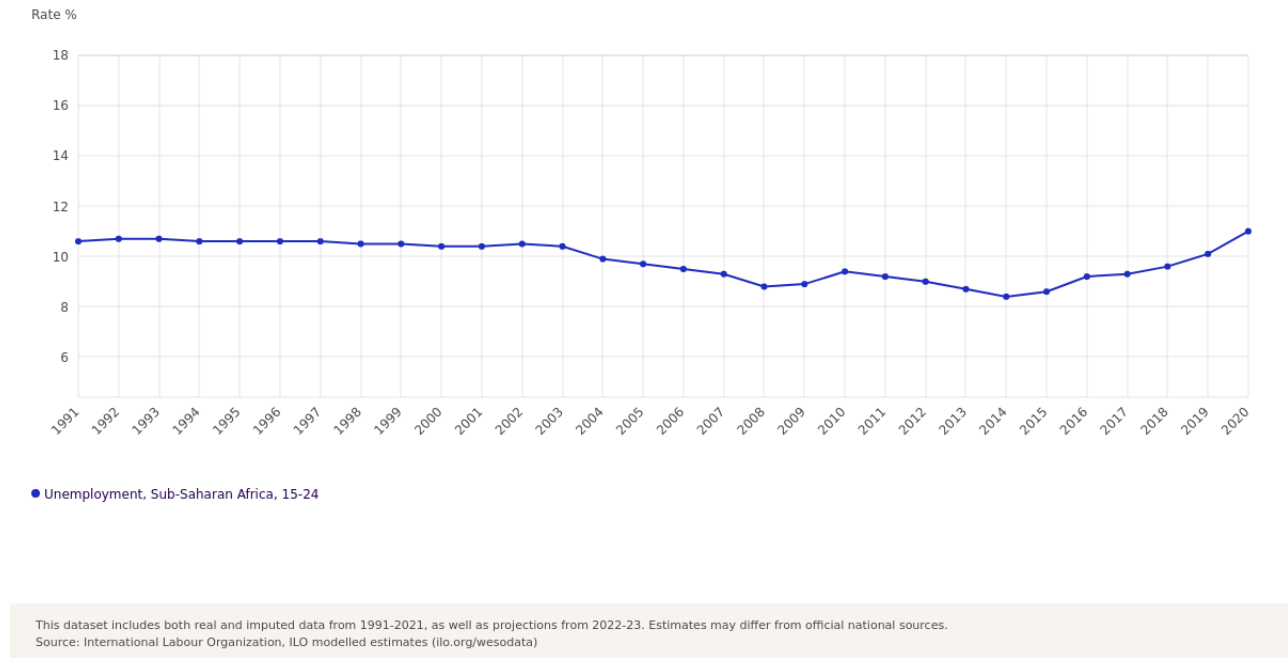


This dataset includes both real and imputed data from 1991-2021, as well as projections from 2022-23. Estimates may differ from official national sources.
Source: International Labour Organization, ILO modelled estimates (ilo.org/wesodata)

Source: International Labor Organization

About youth unemployment, Figure 1.4 shows the share of young people unemployed in SSA for the period 1991-2020.

Figure 1.4: Youth unemployment

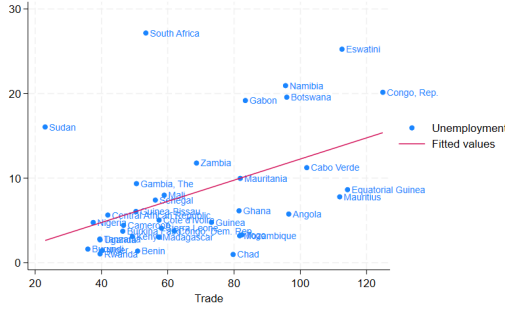


Source: International Labor Organization

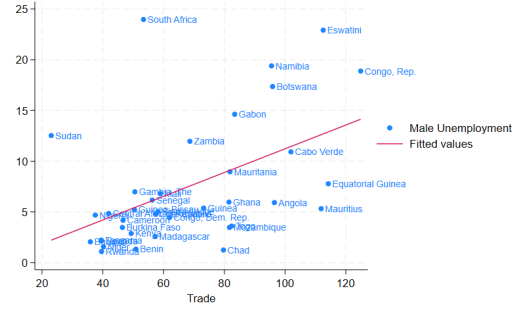
This overview of unemployment trends in SSA shows that unemployment is a main problem in this region. Thus, through several structural adjustment programs and regional integration programs, Sub-Saharan African countries aim to promote employment. We can mention The ECOWAS (Economic Community of West African States) strategy to support the employability of young people in the agro-sylvo-pastoral and halieutic sector in 2019, the EAC (East Africa Community) agreement with the Food and Agriculture Organization (FAO) in order to promote youth employment in rural agriculture and agribusiness, etc. This shows the level of involvement of countries on the issue of unemployment.

1.3.2 Relationship between trade and unemployment

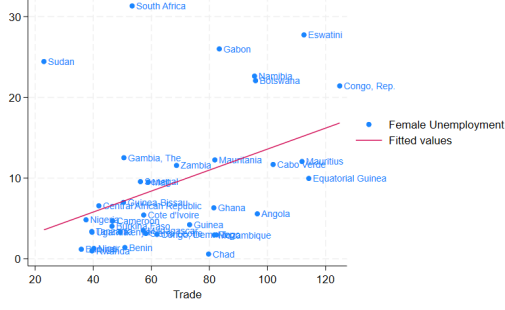
The following figure (Figure 1.5) displays the relationship between trade openness and different unemployment measures (total, male, female and youth unemployment) in SSA. Each graph includes a fitted line representing the general trend of the data. All four graphs show a positive relationship between trade openness and the different measures of unemployment, suggesting that trade openness may be associated with higher unemployment rates across different demographic groups. However, as correlation does not necessarily mean causality, we will provide empirical evidence in this study.



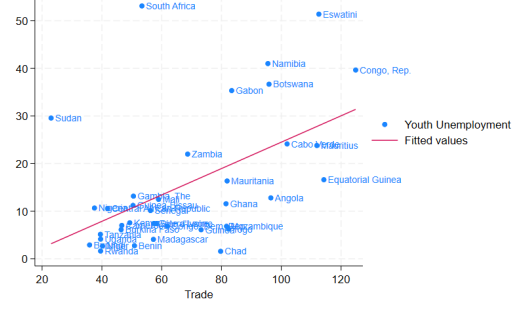
(a) Figure 1: Trade and total unemployment



(b) Figure 2: Trade and male unemployment



(c) Figure 2: Trade and female unemployment



(d) Figure 2: Trade and youth unemployment

Figure 1.5: Trade and unemployment rate

1.4 Data and Methodology

1.4.1 Data

The data are collected from 2000 - 2019 for 37 Sub-Saharan African countries from the World Development Indicators (WDI) and the International Labor Organization (ILO). The choice of the period of study is based on the availability of data. The dependent variable is the unemployment rate measured by the logarithm of the share of the labor force that is without work but available and seeking employment. A set of control variables is also included.

1.4.1.1 Unemployment rate and Trade liberalization

Our dependent variable is the unemployment rate which refers to the share of the labor force that is without work but available for and seeking for employment (ILO). It reflects the inability of an economy to create jobs for people who want to work but do not, even if they are available for work and are actively seeking employment. It is a useful measure of the under-utilization of the labor supply. Following [Dutt et al. \(2009\)](#), we use this measure of unemployment.

We have a variety of trade policy instruments such as tariffs, quotas, taxes etc. There is no single measure of trade openness that summarize this variety of measures ([Dutt et al., 2009](#)).

However, following [Le Goff and Singh \(2014\)](#), [Dutt et al. \(2009\)](#) we choose a measure of effective trade openness instead of a measure of liberalization policies. Also, as argued by [Chang et al. \(2009\)](#), policies measures are difficult to aggregate in a single measure. Then, in our study trade liberalization is measured as the sum of exports and imports as share of GDP. For a robustness check, we also include alternative measures that is exports as share of GDP and imports as share of GDP separately. We expect a negative sign as in [Dutt et al. \(2009\)](#) and [Adamu et al. \(2017\)](#) meaning that trade liberalization has a negative impact on unemployment rate in Sub-Saharan African countries confirming the theoretical model of [Dutt et al. \(2009\)](#) arguing that trade liberalization will reduce unemployment in relatively labor-abundant countries.

1.4.1.2 Control variables

We include a set of control variables.

(i) **GDP per capita constant.** According to [Herbener \(2011\)](#), GDP and unemployment are negatively related. The level of development influences positively the economic activities and therefore requires more labor force. As the economy expands, more job opportunities should be created. We then expect a negative sign for the GDP per capita.

(ii) **Capital.** We also control for investment by using the fixed capital formation. It refers to the rate at which an economy's stock of capital increases or decreases over time. Capital being an input component in production, a positive change is good for the economy. We then expect a negative sign of capital meaning a decrease in unemployment.

(iii) **Inflation.** To control for macroeconomic instability, we use the inflation (consumer price index). The inflation and unemployment are negatively related according to the Philip's curve ([Alrayes and Wadi, 2018](#)). As inflation increases, unemployment should decrease under rational expectations because attempts to change unemployment rate will be undermined by rational workers. They will act rationally to protect their interests. The efforts to lower unemployment will raise inflation. However, these two are not related in the long run ([Gordon, 2013](#)) when we are in adaptive expectations.

(iv) **FDI.** Another source of investment that could improve companies' productions and create more jobs is Foreign Direct Investment (FDI). Then we use the foreign direct investment net inflows as share of GDP to measure this source of investment. FDI inflows is expected to provide the host economies with supplies of investment. It's expected to increase the GDP and have a positive effect on employment, reducing then unemployment. So, we expect a negative sign for this variable.

(v) **Wages.** Following [Adamu et al. \(2017\)](#), we use the GDP per person employed as proxy for real wages. We expect a positive sign given that an increase in wages should lead to fewer

jobs available. Employers should recruit less due to the increase of wages.

Data sources and definitions are provided in appendix.

1.4.2 Methodology

Several theoretical models have linked international trade to unemployment rate. These models demonstrate that there is a complex relationship between trade and unemployment rate depending on the labor market frictions and the industry composition ([Belenkiy and Riker, 2015](#)). In our case, the study analyzes the impact of trade liberalization on labor market precisely on the level of unemployment for Sub-Saharan African countries which are abundant in labor factor. We also analyze the impact of trade liberalization on male unemployment, female unemployment and youth unemployment. We then use more recent data, focuses on SSA in general and not only one country. There is also an emphasis on female and youth unemployment. For this purpose, we follow the theoretical model developed by [Dutt et al. \(2009\)](#) using the Heckscher-Ohlin specification with a focus on Sub-Saharan African countries and including relevant variables as in [Adamu et al. \(2017\)](#) and [Awad and Youssef \(2016\)](#). Then, the following models are estimated:

$$UNP_{i,t} = \alpha + \beta_1 Openness_{i,t} + \beta_2 X_{i,t} + \mu_i + \mu_t + \epsilon_{i,t} \quad (1.1)$$

$$UNPm_{i,t} = \alpha + \beta_1 Openness_{i,t} + \beta_2 X_{i,t} + \mu_i + \mu_t + \epsilon_{i,t} \quad (1.2)$$

$$UNPf_{i,t} = \alpha + \beta_1 Openness_{i,t} + \beta_2 X_{i,t} + \mu_i + \mu_t + \epsilon_{i,t} \quad (1.3)$$

$$UNPy_{i,t} = \alpha + \beta_1 Openness_{i,t} + \beta_2 X_{i,t} + \mu_i + \mu_t + \epsilon_{i,t} \quad (1.4)$$

Where $UNP_{i,t}$ represent the unemployment rate, $UNPm_{i,t}$ the male unemployment rate, $UNPf_{i,t}$ the female unemployment rate, $UNPy_{i,t}$ the youth unemployment rate, $Openness_{i,t}$ the

trade liberalization, $X_{i,t}$ a set of control variables including inflation, foreign direct investment (FDI), GDP per capita, real wages and capital. μ_i and μ_t represent country and time fixed effects respectively. Since unemployment been considered as a dynamic phenomenon meaning that its past value can affect the current one, the equations can be transformed into a dynamic model as follow (Dutt et al., 2009):

$$UNP_{i,t} = \alpha UNP_{i,t-1} + \beta_1 Openness_{i,t} + \beta_2 X_{i,t} + \mu_i + \mu_t + \epsilon_{i,t} \quad (1.5)$$

This reflects the dynamism of the relationship between variables. However, the model may suffer from endogeneity because of the reverse causality (Dutt et al., 2009). In fact, while trade liberalization may affect unemployment, unemployment can also affect trade policies in countries. For instance, countries with higher unemployment may face popular and government pressure to raise trade barriers and adopt protectionism measures. The inclusion of lagged dependent variable to capture persistence in unemployment rates might lead to endogeneity. To overcome the problem of endogeneity, we estimate the coefficients of our model using the two-step System Generalized Method of Moments (GMM) developed by Blundell and Bond (1998). The GMM method allows us to have consistent estimates of the parameters. It consists by first differencing the equation (1.1) which eliminate the country and time fixed effects. The lagged value of our dependent variable (unemployment rate) is used as explanatory variable. Blundell and Blond used Monte Carlo simulations to show that the system-GMM is efficient than the first-differenced GMM method. To ensure the validity of the GMM estimator, we consider the AR(2) test for the serial correlation and the Hansen test of identifying restrictions.

For robustness check purposes, we apply a fixed effect regression, controlling for unobserved heterogeneity. By controlling for unobserved factors that can affect both trade liberalization and unemployment, we make sure that our estimates are not biased and that our results obtained with the GMM estimator are robust.

1.5 Results and discussion

1.5.1 Data description

Descriptive statistics for the variables used in the regression are displayed in Table 1.1. In average, the unemployment rate in SSA is 8.13 between 2000 - 2019 which is above the global rate of unemployment (6.57) ² and the natural unemployment rate ³. This high unemployment

²World Bank, 2020

³The natural unemployment rate is the rate of unemployment when the labor market is in equilibrium since full employment can't be achieved

rate means that an important part of the labor force in SSA available for work is without jobs. The unemployment rate reaches a maximum of 33.29 in South Africa during this period. We noted inequality between women and men in the access to jobs in SSA, average unemployment rate is higher for women (9.30) than for men (7.36). With regard to young people (ages 15-24), the unemployment rate is even higher with an average of 15.37. The youth are struggling to find employment. This may be due to the lack of experience and relevant skills of young people. The rate of inflation is 8.60 on average in SSA during the period 2000 - 2019 which remains very high compared to the global inflation rate (IMF, 2020). This high rate erodes people's income and reduces the access to certain essential goods and services. The GDP per capita growth is low with an average of 1.86% meaning that the average growth rate in SSA is slow. It seems too low for a consequent creation of jobs. As for GDP per employed person as proxy for wages, we have on average 15,900 USD. The minimum of 1,376 USD and the maximum of 130,964 USD show the presence of inequalities between countries in SSA. The average trade of 66.72% of the GDP indicates that Sub-Saharan African countries are quite open.

By looking at the alternative measures of trade openness, we observe that Imports as share of GDP have a higher average (36.63%) than Exports as share of GDP (30.09%). This situation indicates a deficit of trade balance for Sub-Saharan African countries on the period 2000 – 2019. This deficit could lead to decrease of the GDP so a low economic development which remain important for the creation of jobs and then the reduction of unemployment. The investment proxied by the gross capital formation is on average 22.91% of GDP. This indicates a low part devoted to investment in Sub-Saharan African countries on the period 2000 - 2019. Since the capital stock refers to the facilities, goods and equipment used to undertake the productive work of the economy, a higher share of the GDP should be devoted to it. Some countries nevertheless record a high level of investment with a maximum of 79.4% of GDP. As for FDI, we have on average 4.08% of GDP net inflows, which is higher than the global FDI net inflows. However, Sub-Saharan African countries need to make more efforts in order to attract foreign investors in their countries.

Table 1.1: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Unemployment	740	8.13	7.13	0.32	33.29
Unemployment male	740	7.36	6.24	0.39	27.34
Unemployment female	740	9.30	8.64	0.21	41.37
Unemployment youth (ages 15-24)	740	15.37	14.15	0.46	60.43
Inflation	717	8.60	27.88	-8.975	513.9
GDP per capita constant	740	2032.71	2381.73	270.13	14222.55
Wages (GDP per employed person)	740	15899.98	19559.33	1376.05	130963.90
Trade openness	735	66.72	28.92	1.21	175.79
Export openness	735	30.09	16.88	0.61	89.68
Import openness	735	36.63	15.25	0.58	113.66
Capital	718	22.91	9.57	1.09	79.40
FDI	740	4.08	5.99	-11.19	64.38

1.5.2 Estimation results

The estimates are made considering the overall unemployment rate. In order to test for gender inequalities, the estimates are disaggregated by gender. Finally, given that youth are an important component of the population in SSA, we wanted to measure the effect of trade openness on youth unemployment.

1.5.2.1 Trade liberalization and total unemployment

Table 1.2 shows the results for the two-step system-GMM estimation when the total unemployment is considered. Three estimations are displayed. In the first estimation, trade openness is proxied by the sum of exports and imports to GDP. In the two other estimations, exports as share of GDP and imports as share of GDP are used respectively as alternative measures of openness for robustness. In all the three estimations, the test of over-identification shows that our models are robust. Also, our models have no problem of second order correlation. All the variables are transformed in log. In all three estimations, the coefficient of the lagged dependent variable are positive and significant reflecting the dynamic nature of unemployment. It is noted here that unemployment is a dynamic phenomenon in SSA.

The estimate results point out a negative relationship between trade openness and

unemployment and the evidence is robust to alternative trade openness measures. These results indicate that trade liberalization variables are found to be relevant drivers of employment for Sub-Saharan African countries. The results are in line with [Dutt et al. \(2009\)](#) and [Porto \(2008\)](#). Trade openness can lead to greater economic efficiency and growth by allowing countries to specialize in industries in which they have a comparative advantage. In SSA, increased trade can boost sectors such as agriculture, mining and manufacturing, leading to job creation.

In all three estimations, the investment measured by the gross capital formation has a negative and significant impact on unemployment meaning that an increase in the stock of capital is associated with a decrease of unemployment. An increase in investment is then a good solution for unemployment reduction in SSA. Capital investment is crucial for economic growth and job creation. Increases in capital formation typically lead to infrastructure development, business expansion and productivity improvements. For SSA where infrastructure deficits are a major constraint to growth, increased capital investment can create jobs directly through construction and indirectly by improving the productivity and competitiveness of other sectors.

The foreign direct investment has a negative and significant impact meaning that higher FDI inflows are associated with a reduction in unemployment. FDI can play an important role in job creation, especially in developing countries. However, the small magnitude of the coefficient suggests that while FDI has a positive effect on employment, its impact may be limited, possibly due to the nature of FDI in the region.

The wages proxied by GDP per person employed has a significant and positive impact on unemployment in all three estimations. Higher wages are associated with higher unemployment. This finding could reflect classical economic theory, where higher wages increase labour costs for employers, potentially leading to lower employment levels if wages rise faster than productivity. In the context of Sub-Saharan Africa, where many economies are still developing and labour markets may be less flexible, significant increases in wages could lead to reduced demand for labour.

Looking at the level of development proxied by the GDP per capita, we find a negative and significant coefficient in all three estimations suggesting that an increase in GDP is associated with a decrease in unemployment. Economic growth typically leads to job creation as firms expand and new ones are created. The negative coefficient here is consistent with the idea that as the economy grows, demand for labour increases and unemployment falls.

Regarding the inflation, we find a positive and significant impact on unemployment in all three estimations. A higher inflation rate is associated with an increase in unemployment. In the context of SSA, high inflation can lead to economic instability, eroding purchasing power and reducing consumer demand. This can have a negative impact on businesses, leading to reduced

hiring or even layoffs. In addition, inflation can lead to higher interest rates, which can dampen investment and reduce job creation.

Table 1.2: Trade liberalization and total unemployment

VARIABLES	(1)	(2)	(3)
	Model 1	Model 2	Model 3
L.Unemployment	0.559*** (0.037)	0.586*** (0.037)	0.484*** (0.035)
Trade	-0.097*** (0.024)		
Export		-0.080*** (0.021)	
Import			-0.085*** (0.015)
Inflation	0.018*** (0.004)	0.016*** (0.005)	0.017*** (0.004)
GDP	-0.769*** (0.087)	-0.692*** (0.098)	-0.885*** (0.109)
Wage	0.990*** (0.076)	0.923*** (0.100)	1.119*** (0.113)
Capital	-0.074*** (0.021)	-0.101*** (0.023)	-0.088*** (0.020)
FDI	-0.014*** (0.005)	-0.020*** (0.005)	-0.013** (0.006)
Constant	-2.220*** (0.239)	-2.246*** (0.312)	-2.510*** (0.348)
Observations	579	579	579
Number of country	37	37	37
Hansen test	0.84	0.86	0.70
AR2 test	0.62	0.65	0.62

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

1.5.2.2 Trade liberalization and unemployment by gender

While the first regression only considers trade liberalization on global unemployment, we next consider the male unemployment rate and the female unemployment rate separately. This distinction by gender makes it possible to compare the effect of trade liberalization on unemployment rate for men and women separately. It also allows us to see whether trade

liberalization affects more male unemployment or female unemployment or benefit more men or women in the search for a job. We first estimate the relation between trade liberalization and male unemployment (Table 1.3). As in the case of total unemployment rate, three estimations are displayed here. The first estimation using sum of imports and exports as share of GDP as measure of trade openness. The second estimation using exports as share of GDP and the third estimation using imports as share of GDP as alternative measures for trade openness. The estimate results point out a negative relationship between trade openness and male unemployment. An increase in trade openness is associated with a reduction in male unemployment. Trade openness appears to slightly reduce male unemployment by increasing economic opportunities in sectors where men are predominantly employed, such as manufacturing and resource extraction. Greater integration into the global market may lead to increased demand for labour in these sectors.

Concerning the control variables, we find the same results as in total unemployment results. GDP and capital investment are beneficial in reducing male unemployment, higher wages and inflation are associated with higher unemployment among men. The effect of FDI on male unemployment is not significant in this analysis.

Table 1.3: Trade liberalization and male unemployment

VARIABLES	(1)	(2)	(3)
	Model 1	Model 2	Model 3
L.Unemployment	0.844*** (0.042)	0.768*** (0.030)	0.876*** (0.039)
Trade	-0.045** (0.021)		
Export		-0.048*** (0.013)	
Import			-0.024* (0.015)
Inflation	0.010*** (0.002)	0.010*** (0.002)	0.008*** (0.001)
GDP	-0.201** (0.081)	-0.204* (0.116)	-0.132** (0.066)
Wage	0.262*** (0.078)	0.311*** (0.116)	0.189*** (0.066)
Capital	-0.086*** (0.015)	-0.088*** (0.014)	-0.081*** (0.013)
FDI	-0.003 (0.004)	-0.005 (0.003)	-0.007 (0.005)
Constant	-0.276 (0.267)	-0.585** (0.245)	-0.257 (0.239)
Observations	579	579	579
Number of country	37	37	37
Hansen test	0.85	0.84	0.81
AR2 test	0.33	0.37	0.30

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

We then estimate the relation between trade and female unemployment rate (Table 1.4). The results point out a significant and negative coefficient for trade in all three models. The effect of trade openness on female unemployment is stronger than on male unemployment. This suggests that trade liberalization may create more employment opportunities for women, possibly in labour-intensive sectors or in sectors where women are predominantly employed. This finding is consistent with the prediction of the Heckscher-Ohlin-Stolper-Samuelson theory which shows that, to the extent that female workers predominate in lower-skilled jobs in developing economies such as those in SSA, there are generally employment gains for women in export sectors of the

economy. The finding is also in line with [Becker \(2010\)](#) which argue that women should be expected to benefit from trade since trade leads to increased competition and therefore induces companies to reduce the cost of discrimination by hiring more women. Trade liberalization can then be an important source of reduction of inequality between men and women in job market in SSA.

Concerning the control variables, we find the same results as in total unemployment results. Inflation and higher wages are associated with larger increases in female unemployment, highlighting the vulnerability of female employment to economic instability. In addition, while GDP and FDI have a positive impact on female employment, capital investment appears to have a weaker and less consistent impact on reducing female unemployment compared to male unemployment.

Table 1.4: Trade liberalization and female unemployment

VARIABLES	(1)	(2)	(3)
	Model 1	Model 2	Model 3
L.Unemployment	0.384*** (0.033)	0.326*** (0.043)	0.298*** (0.065)
Trade	-0.174*** (0.031)		
Export		-0.184*** (0.017)	
Import			-0.141*** (0.033)
Inflation	0.027*** (0.003)	0.028*** (0.003)	0.022*** (0.004)
GDP	-1.301*** (0.114)	-1.662*** (0.171)	-1.309*** (0.303)
Wage	1.678*** (0.147)	2.024*** (0.168)	1.677*** (0.313)
Capital	-0.041 (0.025)	-0.061*** (0.023)	-0.012 (0.029)
FDI	-0.014*** (0.004)	-0.015*** (0.003)	-0.014** (0.007)
Constant	-4.172*** (0.655)	-4.682*** (0.472)	-4.260*** (0.917)
Observations	579	579	579
Number of country	37	37	37
Hansen test	0.80	0.69	0.84
AR2 test	0.72	0.76	0.58

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

1.5.2.3 Trade liberalization and youth unemployment

Finally, we take a look at the youth unemployment rate which represents young people aged 15 to 24 and are without jobs and seeking for. Pay attention to youth unemployment is important as SSA is the world's youngest region. Improving employment for youth is then important in the poverty reduction strategy. Then, the Table 1.5 shows the results of the two-step system-GMM when the youth unemployment rate is considered. As for previous estimates, three estimations are considered.

The results indicate a negative and significant coefficient for trade in all three estimations for trade suggesting that trade liberalization tends to reduce youth unemployment in SSA. As for other estimations, trade liberalization is a relevant driver for youth employment in SSA. Youth unemployment is negatively related to trade liberalization. This result is in line with [Anyanwu \(2014\)](#). Giving the high level of youth unemployment rate in the region ⁴, trade liberalization could be an interesting way out.

Concerning the control variables, we find the same results as in total unemployment results. Inflation and higher wages are associated with increases in youth unemployment. Capital investment and FDI contribute to reducing youth unemployment.

⁴14.5 in 2020 (World Bank, 2020)

Table 1.5: Trade liberalization and youth unemployment

VARIABLES	(1)	(2)	(3)
	Model 1	Model 2	Model 3
L.Unemployment	0.519*** (0.050)	0.520*** (0.042)	0.451*** (0.056)
Trade	-0.126*** (0.035)		
Export		-0.116*** (0.033)	
Import			-0.099*** (0.037)
Inflation	0.015** (0.006)	0.020*** (0.005)	0.018*** (0.004)
GDP	-0.519*** (0.096)	-0.661*** (0.161)	-0.546*** (0.130)
Wage	0.857*** (0.115)	1.006*** (0.182)	0.919*** (0.155)
Capital	-0.033 (0.022)	-0.098*** (0.022)	-0.035 (0.023)
FDI	-0.023*** (0.007)	-0.019*** (0.006)	-0.019** (0.009)
Constant	-2.412*** (0.377)	-2.728*** (0.517)	-2.807*** (0.482)
Observations	579	579	579
Number of country	37	37	37
Hansen test	0.54	0.75	0.45
AR2 test	0.75	0.86	0.75

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

1.6 Robustness check

As said previously, we run a fixed effect estimation for robustness check (Table 1.6). The estimation include three models as in the baseline specification. When we consider total unemployment, we find a significant negative relationship between trade liberalisation and overall unemployment, suggesting that increased trade, whether measured by overall trade openness, exports or imports, tends to reduce unemployment. This additional result confirms the finding of our baseline results.

Table 1.6: Trade liberalization and total unemployment (Fixed effect estimation)

VARIABLES	(1)	(2)	(3)
	Model 1	Model 2	Model 3
Trade	-0.122*** (0.033)		
Export		-0.106*** (0.031)	
Import			-0.103*** (0.033)
Inflation	-0.007 (0.013)	-0.006 (0.013)	-0.006 (0.013)
GDP	-1.922*** (0.279)	-1.865*** (0.275)	-1.892*** (0.281)
Wage	1.960*** (0.262)	1.936*** (0.262)	1.908*** (0.262)
Capital	0.007 (0.037)	-0.014 (0.036)	0.011 (0.038)
FDI	-0.005 (0.010)	-0.007 (0.010)	-0.006 (0.010)
Constant	-1.933** (0.812)	-2.202*** (0.830)	-1.820** (0.812)
Time fixed effect	Yes	Yes	Yes
Number of observations	605	605	605
R-squared	0.12	0.11	0.11

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

1.7 Conclusion

This paper focused on the relationship between trade liberalization and unemployment in SSA. A descriptive analysis and an overview of trends in unemployment are also presented. To empirically evaluate the impact of trade liberalization on unemployment, we used the Generalized Method of Moments (GMM) to avoid potential endogeneity and because of the dynamic nature of the model. Our findings show that trade have a significant negative effect on unemployment over the period 2000 - 2019. By taking into account the gender and considering separately male unemployment and female unemployment, we found that trade still have a negative impact on both male and female unemployment with a greater impact on female unemployment. With regard to youth unemployment, we also noted a significant and negative effect of trade. This finding remains significant with alternative empirical measure. Besides that, economic growth and strategic investment have been found to be critical tools for reducing unemployment.

In term of policy implications, several recommendations can be made based on the empirical results. Our findings suggest that trade liberalization is a good way of creating jobs. Policymakers should then firstly continue to pursue trade liberalisation policies, including the reduction of tariffs and non-tariff barriers, to deepen SSA's integration into the global economy. Governments should implement policies that support the growth of export-oriented industries, especially those with the potential to employ large segments of the population. Secondly, given the potential of capital investment to reduce unemployment, priority should be given to policies that encourage both domestic and foreign investment in infrastructure, technology and other productive assets. This may include tax incentives, improved access to finance and streamlined regulatory procedures. Policies should focus on attracting investment in sectors such as manufacturing, agriculture and services, which have a higher potential for job creation. Thirdly, the gender analysis show that the negative impact of trade liberalization is higher for female unemployment than male unemployment. Then, gender-equity policies are necessary to promote gender-equitable employment such as improving girls' education. Finally, young people employment should be priority for Sub-Saharan African countries. Then, programs that include training programs for youth unemployed people, job search assistance, and the creation of jobs for youth unemployed people could be created.

1.8 Appendix

Table 1.7: List of Countries (37)

Angola	Kenya
Benin	Madagascar
Botswana	Mali
Burkina Faso	Mauritania
Burundi	Mauritius
Cabo Verde	Mozambique
Cameroon	Namibia
Central African Republic	Niger
Chad	Nigeria
Congo, Dem. Rep.	Rwanda
Congo, Rep.	Senegal
Cote d'Ivoire	Sierra Leone
Equatorial Guinea	South Africa
Eswatini	Sudan
Gabon	Tanzania
Gambia	Togo
Ghana	Uganda
Guinea	Zambia
Guinea-Bissau	

Table 1.8: Variables and data source

Variables	Source
Unemployment rate	International Labor Organization (ILO)
Unemployment rate male	International Labor Organization (ILO)
Unemployment rate female	International Labor Organization (ILO)
Unemployment rate youth (ages 15-24)	International Labor Organization (ILO)
Inflation	World Bank WDI
GDP per capita constant	World Bank WDI
Wages (GDP per employed person)	World Bank WDI
Trade openness	World Bank WDI
Export openness	World Bank WDI
Import openness	World Bank WDI
Gross capital formation	World Bank WDI
FDI	World Bank WDI

Chapter 2

The impact of Cereal Trade on Food Security: Empirical Evidence from Sub-Saharan Africa

Abstract: Sustainable Development Goal 2 (SDG2) aims to end world hunger, but Africa is currently not on track to meet this goal. Sub-Saharan Africa is particularly affected, with a significant increase in undernourished people. The issue of food security is, therefore, a pressing concern, and promoting trade has been suggested as one solution. This study examines the impact of cereal import openness on the prevalence of undernourishment for 27 Sub-Saharan African countries for the period 2000 - 2020. Using a two stage least square instrumental variable (2SLS-IV) estimator, we find that greater cereal import openness is significantly associated with higher levels of undernourishment in Sub-Saharan Africa and then increase food insecurity. Our results are robust to alternative food security indicators.

Keywords: Food security, Cereal trade openness, Sustainable Development Goals, Sub-Saharan Africa

2.1 Introduction

Food security is defined as "a situation that exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" ([Barrett, 2010](#); [Shaw, 2007](#)). Thus, food security means having enough food to eat regularly. As one of the Sustainable Development Goals, food security has been a global concern since 2015, with an increase in the number of hungry people worldwide. According to the Food and Agriculture Organization (FAO) of the United Nations (UN), between 720 and 811 million people worldwide faced hunger in 2020. This growing insecurity threatens people's livelihoods, especially the most vulnerable. The impact from the pandemic and recent war between Ukraine and Russia have increased food insecurity in Sub-Saharan Africa by at least 30 percent since early 2020 ([Baptista et al., 2022](#)). Despite reductions in hunger and poverty levels, over 26% of the global population still experiences moderate or severe food insecurity, with the majority in Asia and Sub-Saharan Africa ([UNICEF, 2021](#); [WHO, 2021](#)). Additionally, UN population projections suggest that the Sub-Saharan African population will reach 2.2 billion by 2050, and the continent's fastest population growth could threaten food security.

In the early 2000s, African countries were already committed to improving food security by increasing their efforts in the agricultural sector. Then, in 2003, those countries committed to devoting 10% of the national budgetary resources to promoting the agricultural sector, citing its importance for improving food security. This commitment is known as the Maputo declaration. However, this commitment has not been sufficient to improve food security. More recently, this commitment has been reaffirmed in the Malabo declaration with aim to end hunger in Africa by 2025. We can also note the existence of sub-regional organizations, such as the Network of Farmers Organizations and Agricultural producers of West Africa, which aim to provide rural and urban populations with sufficient quality and quantity of food.

In this context, many countries have recognized the importance of trade openness to ensure adequate food security and are increasingly reliant on international trade for food security ([Sun and Zhang, 2021](#)). The benefits of free trade are widely recognized in economic theory. Trade openness enables countries to better utilize their comparative advantages and contribute to economic growth, which can benefit poverty reduction and food security ([Chikhuri, 2013](#)). Moreover, trade openness can improve food security in Africa ([Simola et al., 2022](#)).

The connection between trade and food security has become a topic of greater interest, as trade could be one of the means to achieve the Sustainable Development Goals (SDGs). Specifically, Sustainable Development Goal 2 (SDG2) seeks to end hunger, attain food security, enhance nutrition, and promote sustainable agriculture. Target 2.1 of SDG2 aims to end hunger

by 2030 and guarantee year-round access for all individuals, particularly the poor and vulnerable, including infants, to safe, nutritious, and adequate food ¹.

Trade liberalization has been proposed as a potential solution to eradicate hunger and malnutrition. Trade can connect countries with comparative advantages in sectors such as agriculture, while consumers can access a broader range of nutritious foods. Additionally, trade liberalization is anticipated to boost income levels, reduce poverty, and enhance overall well-being. Trade openness can lead to better food availability and diversity ([Anderson, 2016](#); [Baldos and Hertel, 2015](#); [Burgess and Donaldson, 2010](#); [Dithmer and Abdulai, 2017](#); [Donaldson, 2018](#); [Dorosh and Rashid, 2013](#)). Trade openness can mitigate food price volatility ([Dorosh et al., 2009](#); [McCorrison et al., 2013](#); [Rutten et al., 2013](#)). Promote lower inputs costs and the increase of agricultural productivity ([Dávalos et al., 2020](#); [Dithmer and Abdulai, 2017](#)), new employment opportunities and higher incomes ([Houssa and Verpoorten, 2015](#); [Montalbano et al., 2018](#)). Trade can also increase the diversity of micro nutrients and macro nutrients ([Wood et al., 2018](#)). Therefore, we anticipate that trade liberalization will impact food security in developing countries.

Trade liberalization can also negatively impact food security in Sub-Saharan Africa. Indeed, it can lead to a dependence on imported food which can lead to higher prices for local consumers. This could also affect local small-scale farmers (depending on the policies design). The increased competition could also lead to greater fragility of domestic food supply and make small-scale farmers more vulnerable to foreign shocks. Trade liberalization can lead to a decrease in availability because of higher incentives to export ([Devereux, 2009](#); [Dreze and Sen, 1990](#); [Watts and Bohle, 1993](#)). The higher exposures to economic shocks due to trade liberalization can also lead to higher food prices ([Flachsbarth and Garrido, 2014](#); [Headey, 2011](#); [Mary, 2019](#); [McCorrison et al., 2013](#); [Rutten et al., 2013](#)).

However, considering trade as whole may not be enough when it comes to food security. This is why we have decided to focus on the cereal trade in our analysis. In fact, cereals are the primary source of energy for more than 962 million people across Sub-Saharan Africa². They are therefore essential to food security. Cereal trade can both have positive and negative effects on food security. Cereal trade can enhance the access to food by importing cereals for countries with insufficient domestic production, the diversification of the food sources but also generate income for farmers and countries through cereals export. On the other way, the dependency on cereal imports can also negatively affect food security by making countries vulnerable to trade barriers, price fluctuations, external shocks. While our focus is on cereal trade, this does not imply that other food items or factors are unimportant. Other food items and factors also play

¹United Nations 2030 Agenda for Sustainable Development

²OECD-FAO Agricultural Outlook 2016-2025

critical roles in determining food security. However, cereals are often the staple food and major source of calories in SSA, making their trade particularly significant for food security analysis.

Our analysis focuses on Sub-Saharan African countries which face significant challenges related to food insecurity. In fact, more than one-third of the world's undernourished people, representing 282 million in 2020, are in Africa, an increase of 46 million more than in 2019 (FAO, 2021). The worsening situation is attributed to several factors, including ongoing conflicts, climate variability, and economic conditions. As a result, Africa is not making sufficient progress toward achieving the Sustainable Development Goal of ending hunger. It is, therefore, compelling to examine how cereal trade affect food security in this region of the world. Our objective is to investigate the impact of cereal trade on food security represented by the prevalence of undernourishment and to examine the effects of other economic and non-economic factors (represented by our control variables) on food security.

Previous studies have examined the impact of trade openness on food security in Africa (Bonuedi et al., 2020; Chikhuri, 2013; Dithmer and Abdulai, 2017). However, none of these studies has specifically considered the cereal trade. Marson et al. (2023) in addition to considering total trade also took specific account of cereal trade. However, the study was not specific to the Sub-Saharan Africa. Then, the presence of countries such as Brazil, Russia and Ukraine which are among the biggest cereal exporters of the world in their study could lead to some results that are not representative of the situation of the region. In fact, most of Sub-Saharan African countries are net cereal importers. We therefore propose to focus on the Sub-Saharan African region.

The reminder of the paper is organized as follows. Section 2.2 presents the theoretical framework, section 2.3 the literature review. The section 2.4 presents some stylized facts about food security trend in Sub-Saharan Africa. Section 2.5 describes the data used and the methodology. Section 2.6 discusses the empirical results. Section 2.7 concludes the paper.

2.2 Theoretical framework

This section explores the theoretical framework and the economic mechanisms through which trade affects food security. According to the FAO, food security is a multidimensional concept including availability, access, utilization and stability. The availability means sufficient quantities of food of appropriate quality. Access refers to individuals with access to adequate resources for acquiring appropriate foods for a nutritious diet. The utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met and the stability meaning being food secure and refers to a population, household or individual with access to adequate food at all times (FAO, 2003).

Trade openness can affect food security and then each dimension of this concept.

When it comes to the access dimension, trade openness can affect the access to food via its effects on prices, the availability of production factors, economic growth, household incomes and employment (Dithmer and Abdulai, 2017). Trade can contribute for example to more production factors through its effects on prices. The producers can also benefit from the increased demand for goods due to trade openness. Moreover, trade openness favors exports of products manufactured using a relatively abundant factor in most developing countries, namely (low-skilled) labour, thus creating employment opportunities (also for non-agricultural income) and increasing household incomes (Stolper-Samuelson theorem) (Dithmer and Abdulai, 2017). According to Jaffee et al. (2011), this process can lead to a reduction of poverty and an increase of food security. Trade openness can also lead to more access to food products through food aid. In fact, the openness of a country may positively affect the possibility to receive food aid (FAO, 2005). Alesina and Dollar (2000) for instance show that the direction of foreign aid is influenced by strategic considerations. With regard to the availability dimension, trade openness will allow countries an access to larger markets and a diverse range of food products. Trade openness provides access to larger markets, offers opportunities for specialization in production and dynamic efficiency gains through factors such as economies of scale, technology transfers and knowledge spillovers, and thus improves opportunities to generate export revenues (Wacziarg and Welch, 2008). Trade may then lead to an increase of food products available for the population and also a greater variety of goods. In addition, export earnings can be used to import production inputs such as machinery, fertilizers and pesticides. However, debt servicing obligations and deteriorating terms of trade between agricultural products and manufactured goods can limit the scope for financing food imports for countries whose main source of foreign exchange is agricultural products (FAO, 2019).

Trade openness can also lead to food stabilization by mitigating situations of excess demand or supply on domestic markets, thereby stabilizing national food supplies and reducing price fluctuations (Dithmer and Abdulai, 2017). A more open trade regime can therefore reduce the variability of (staple) food supply, as countries have more options for improving food availability than under a policy of self-sufficiency. It also relieves countries of some of the burden of costly stock maintenance interventions FAO (2000).

2.3 Literature review

The importance of trade openness in maintaining adequate food security has been recognized by more countries, leading to extensive debates (Fusco et al., 2020). Trade openness provides access to larger markets, enabling specialization in production and opportunities to improve

productivity and generate export earnings, realizing dynamic efficiencies such as economies of scale, technology transfers, and knowledge spillovers (Wacziarg and Welch, 2008). Trade can thus increase the total amount of goods, including food, available to the national population and enhance the variety of goods available (FAO, 2000). Despite the potential role of trade openness in achieving food security, more research is needed. However, only a few studies have analysed the impact of trade on food security (Bonuedi et al., 2020; Dithmer and Abdulai, 2017; Sun and Zhang, 2021). Several case studies have examined the impact of trade reforms on food security (FAO, 2006), but they used poverty indicators instead of food security indicators (Dithmer and Abdulai, 2017).

In the literature, there is a debate on the impact of trade on food security. Some authors argue that removing trade barriers can increase accessibility to the international market, reduce the price of imported goods, and provide availability and diversity of foods. For instance, Chikhuri (2013) found that international trade is a significant tool for reducing hunger in developing countries, based on their analysis of the impact of alternative agricultural trade liberalization strategies in the Sub-Saharan region.

In the same vein, some authors have analysed the impact of trade on food security and found mixed results. Tanaka and Hosoe (2011) studied the impact of agricultural trade liberalization, specifically the rice trade, on Japan's food security. They found that rice trade liberalization increases welfare even during domestic productivity shocks. Protectionism of the domestic rice market will harm Japan's national food security rather than ensure it.

We also note the work of Dithmer and Abdulai (2017), who investigated the impact of trade openness on food security measured by dietary energy consumption. Their findings suggest that trade openness positively and significantly impacts food security, meaning that trade openness significantly contributes to food security. Moreover, FAO (2003) argues that trade openness has been consistent with food security by leading to lower food prices that benefit everyone, including the most severely food insecure, and more diverse diets that make the poorer classes less vulnerable to the unavailability of foodstuffs or the fluctuation of the prices of certain foodstuffs.

Recently, Sun and Zhang (2021) estimated the impact of trade openness on food security in Central Asian countries. They found a U-shaped relationship between trade openness and food security, meaning that trade openness improves food security beyond a certain threshold in those countries. Always in Asia, Zakaria et al. (2016) empirically analysed the effects of trade openness on undernourishment in South Asian countries. Results suggest that undernourishment has decreased after trade liberalization.

Similarly, the study by Bonuedi et al. (2020) investigated the impact of easing trade across

borders on food security in Africa and found that poor trade facilitation contributes to food insecurity, implying that trade facilitation is an essential driver of food security. Furthermore, [Fusco et al. \(2020\)](#) examined the effect of trade openness on food security in European countries using two food security indicators. They concluded that trade openness has a significant impact on food security.

While some studies have found that trade openness can positively impact food security, others have suggested that it could lead to harm by making the food supply more dependent on imports and harming small farmers in developing countries. For instance, [Tanaka and Hosoe \(2011\)](#) found that trade openness could lower food self-sufficiency and make the food supply more dependent on imports, while [Moon \(2011\)](#) argued that agriculture could not be allowed to be freely traded due to its complex problems. Furthermore, [Kang \(2015\)](#) found that trade liberalization initially worsened food security in less developed countries, but the situation could be reversed with good policies. Protectionist policies have also been observed in response to increased hunger, as found by [Mary \(2019\)](#).

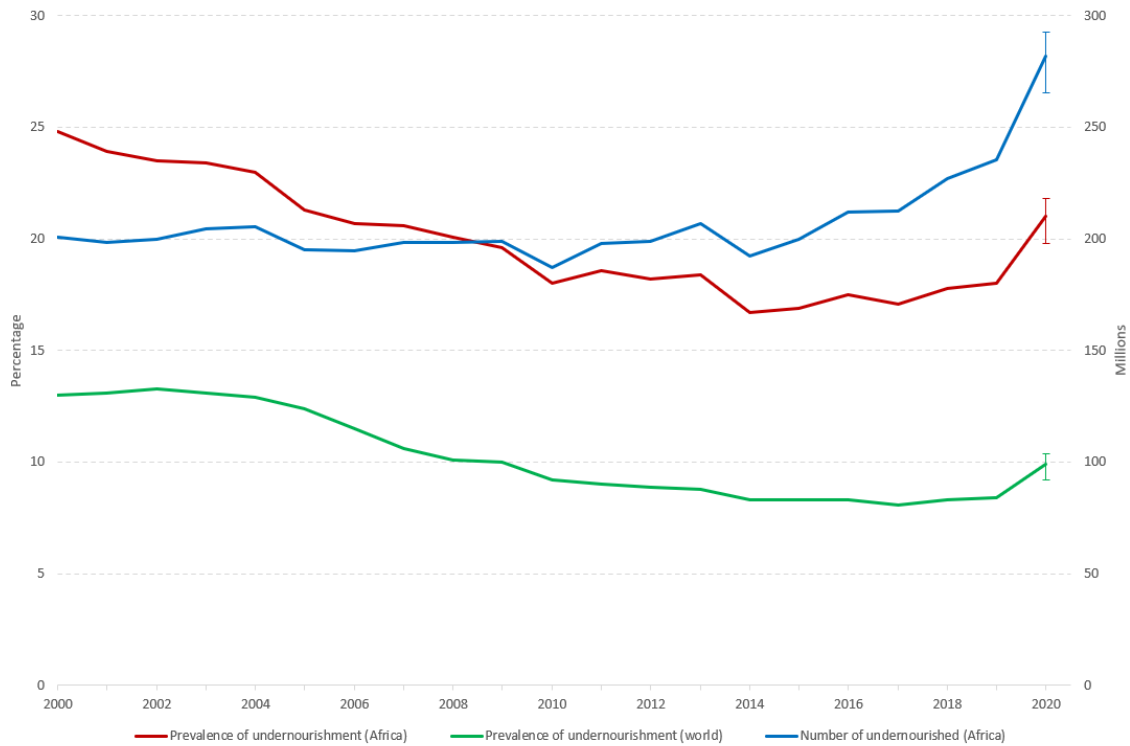
While there have been a vast literature examining the impact of trade on food security, such as those conducted by [Chikhuri \(2013\)](#), [Dithmer and Abdulai \(2017\)](#), and [Bonuedi et al. \(2020\)](#), we do not have a lot of evidence concerning the impact of cereal trade on food security. We can mention the work of [Tanaka and Hosoe \(2011\)](#) which analysed the impact of rice trade on Japan's food security and [Marson et al. \(2023\)](#) which analysed the impact of trade on food security in developing countries while emphasizing the cereal sector. However, we do not find any sufficient evidence concerning the Sub-Saharan Africa region. Therefore, our study aims to fill this gap by examining the impact of cereal trade on food security in SSA.

2.4 Stylized Facts

2.4.1 Food security trend in Africa

To begin with, some stylized facts about African countries using FAO data are informative. The prevalence of undernourishment (PoU) measure of hunger has significantly increased from 16.7% in 2014 to 21% in 2020, which is far higher than the world's prevalence of undernourishment at 9.9% in 2020 (Figure 2.1).

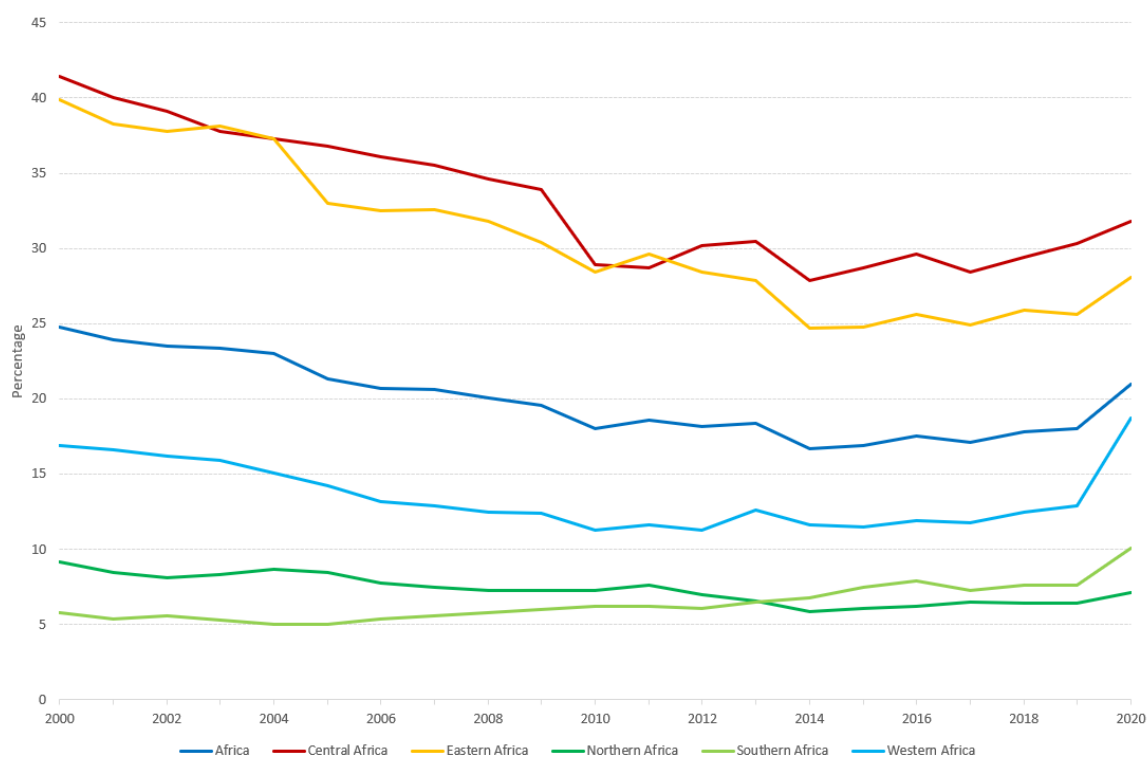
Figure 2.1: Prevalence of undernourishment in the World and Africa, and the number of undernourished in Africa



Source: FAOSTAT

A regional breakdown allows us to observe which part of the continent is more affected by food insecurity. Figure 2.2 shows North Africa is the least affected, with a Prevalence of Undernourishment of 7.1% in 2020, compared to 10.1% for Southern Africa, 18.7% for Western Africa, 28.1% for Eastern Africa, and 31.8% for Central Africa during the same period.

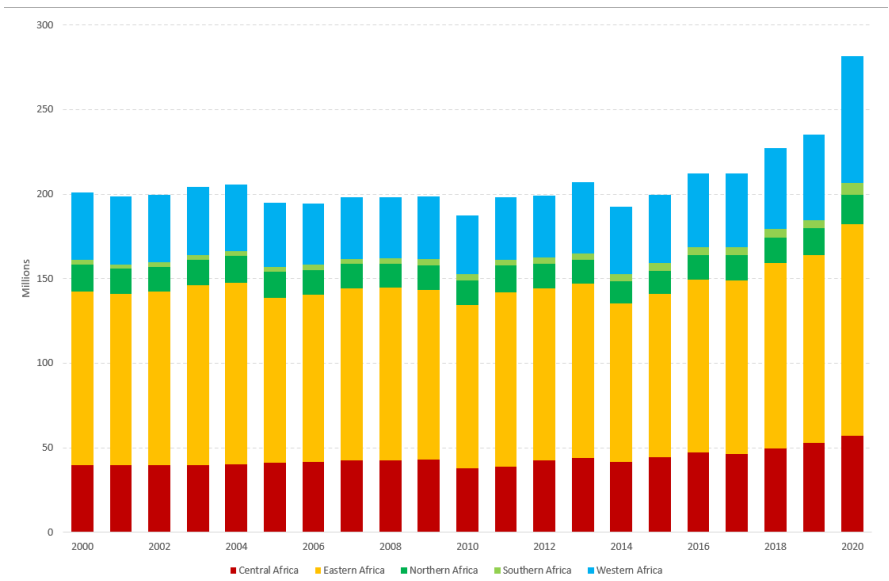
Figure 2.2: Prevalence of undernourishment in Africa by sub-region



Source: FAOSTAT

In terms of the number of undernourished individuals (Figure 2.3), this equates to 125.1 million people living in Eastern Africa, followed by Western Africa (75.2 million), Central Africa (57.1 million), Northern Africa (17.4 million), and Southern Africa (6.8 million). Food insecurity in many countries is driven by conflicts (ethnic fractionalization and religious conflicts) and adverse weather conditions (natural disasters).

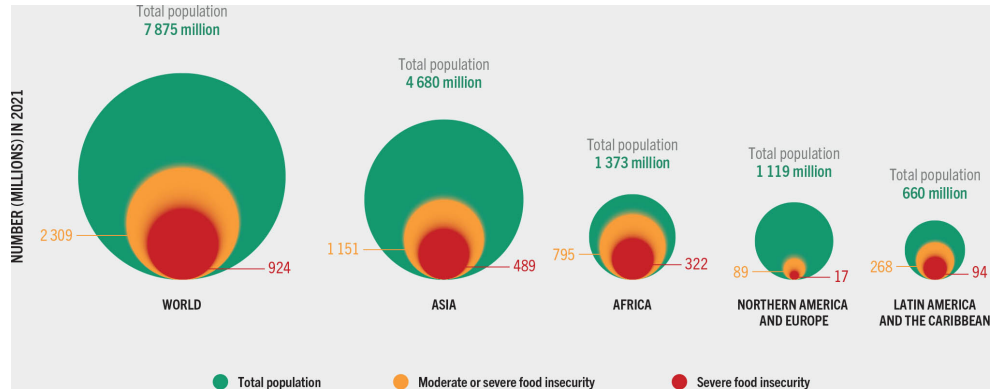
Figure 2.3: Number of people undernourished in Africa by sub-region



Source: FAOSTAT

Figure 2.4 displays food insecurity across different regions, indicating the severity (moderate and severe). As shown, Africa is the second-most affected continent by food insecurity, behind Asia. Regarding moderate or severe food insecurity, 795 million people were affected in Africa in 2021. In terms of severe food insecurity, 322 million people were affected. These figures underscore the concerning state of food insecurity in Africa and the urgent need for solutions.

Figure 2.4: Food insecurity by severity and regions



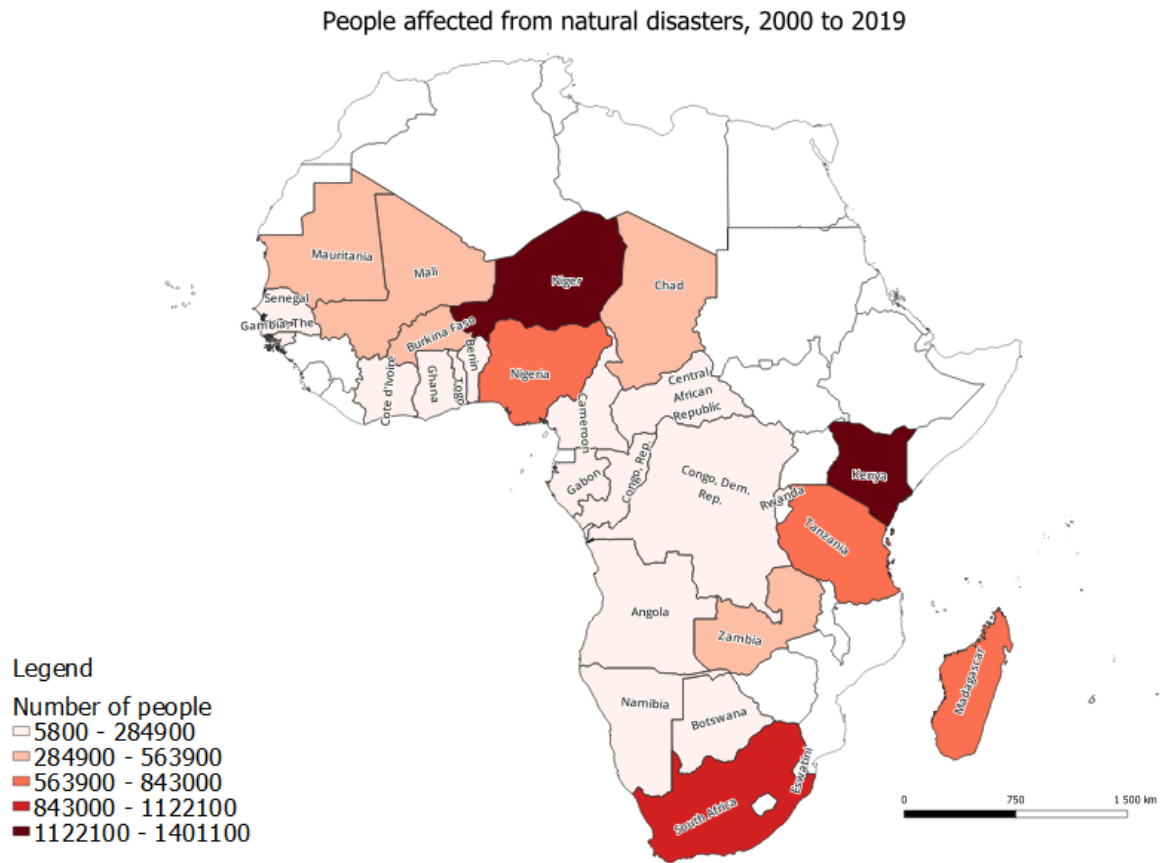
Source: FAOSTAT

2.4.2 Importance of climate

Climate has an important impact on food security, and we would like to highlight the resurgence of climate-driven natural disasters in Africa. Regardless of the type of disaster (biological, hydrological, meteorological, geophysical, or climatological), Africa is vulnerable to adverse

impacts that can harm agriculture and aquaculture production, reducing food availability. Figure 2.5 depicts the total number of people affected by natural disasters during our study period from 2000 to 2019. Natural disasters include epidemics, wildfires, droughts, earthquakes, volcanic eruptions, storms, extreme temperatures, floods, and landslides. Natural disasters between 2000 and 2019 impacted all Sub-Saharan countries in our database. The number of people affected ranged from 5800 to 1,401,100 persons on average.

Figure 2.5: Total people affected from natural disasters, 2000 - 2019



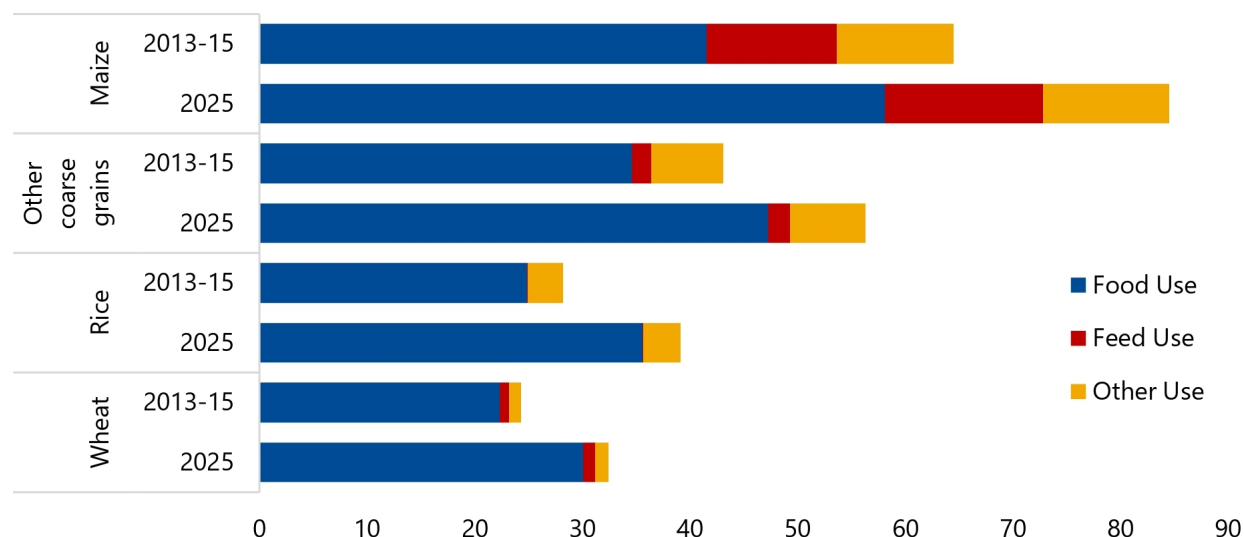
Source: Author's construction using data from EM-DAT database

2.4.3 Importance of cereals

As said previously, cereals are the primary source of energy for more than 962 million people across SSA³. Cereals are then important to food security in the region. The Figure 2.6 shows the cereal consumption in SSA a with a projection till 2025. As we can see, maize is the most important staple for consumption.

³OECD-FAO Agricultural Outlook 2016-2025

Figure 2.6: Cereal demand composition



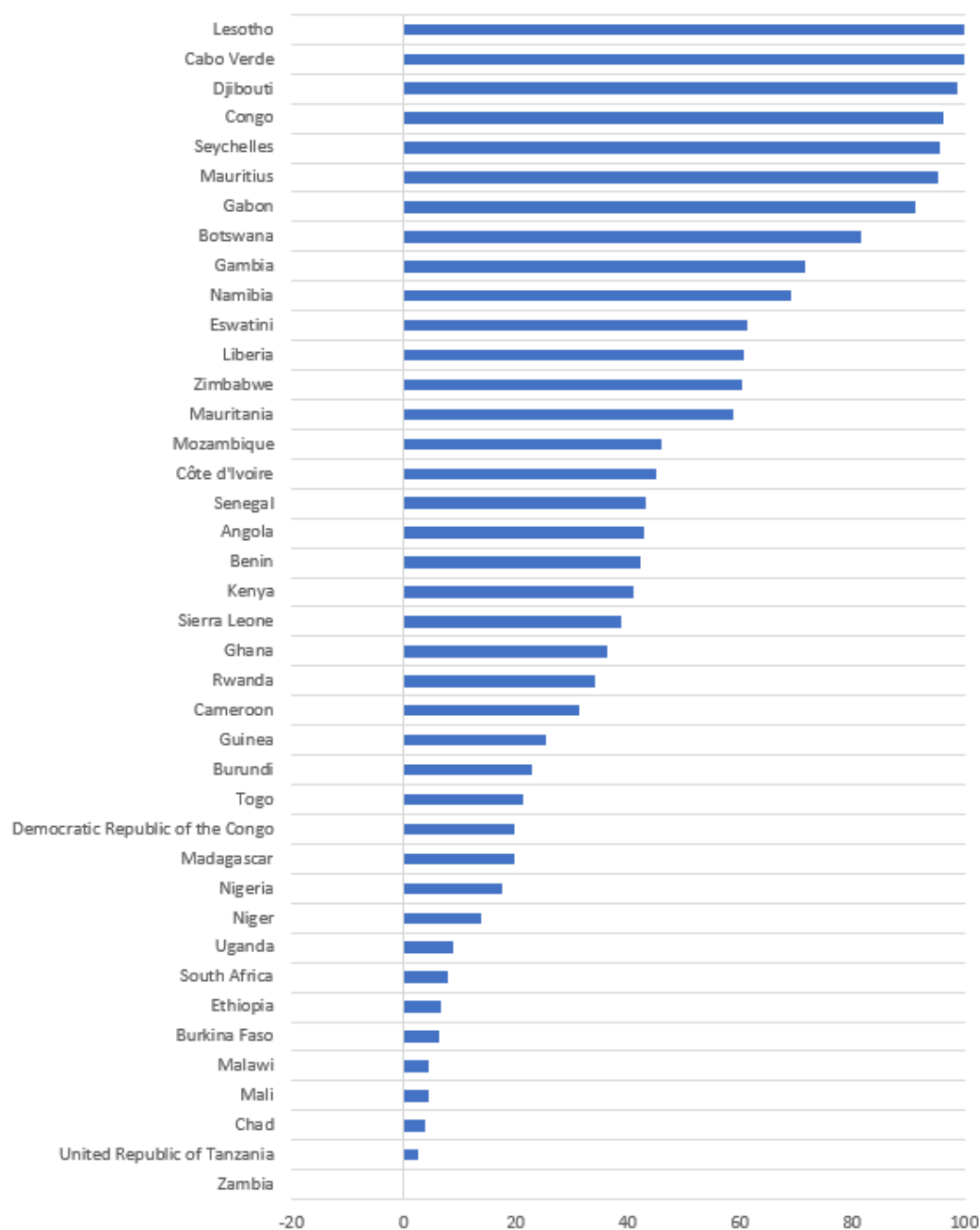
Source: OECD/FAO (2016), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database)

2.4.4 Cereal trade

With regard to cereal trade, many countries in SSA are net importers of cereals. Despite efforts to increase domestic production, import dependence remains significant due to population growth, limited arable land, and low productivity. As we can see on the Figure 2.7, the cereal imports dependency ratio ⁴ developed by the FAO tells how much of the available domestic food supply of cereals has been imported and how much comes from the country’s own production. Negative values indicate that the country is a net exporter of cereals. Only Zambia presents a negative value indicating that Zambia is a net exporter of cereals in the region. This figure confirms then the high import dependence in cereal of Sub-Saharan African countries.

⁴It is computed as $(\text{cereal imports} - \text{cereal exports}) / (\text{cereal production} + \text{cereal imports} - \text{cereal exports}) * 100$

Figure 2.7: Cereal import dependency ratio, 2018



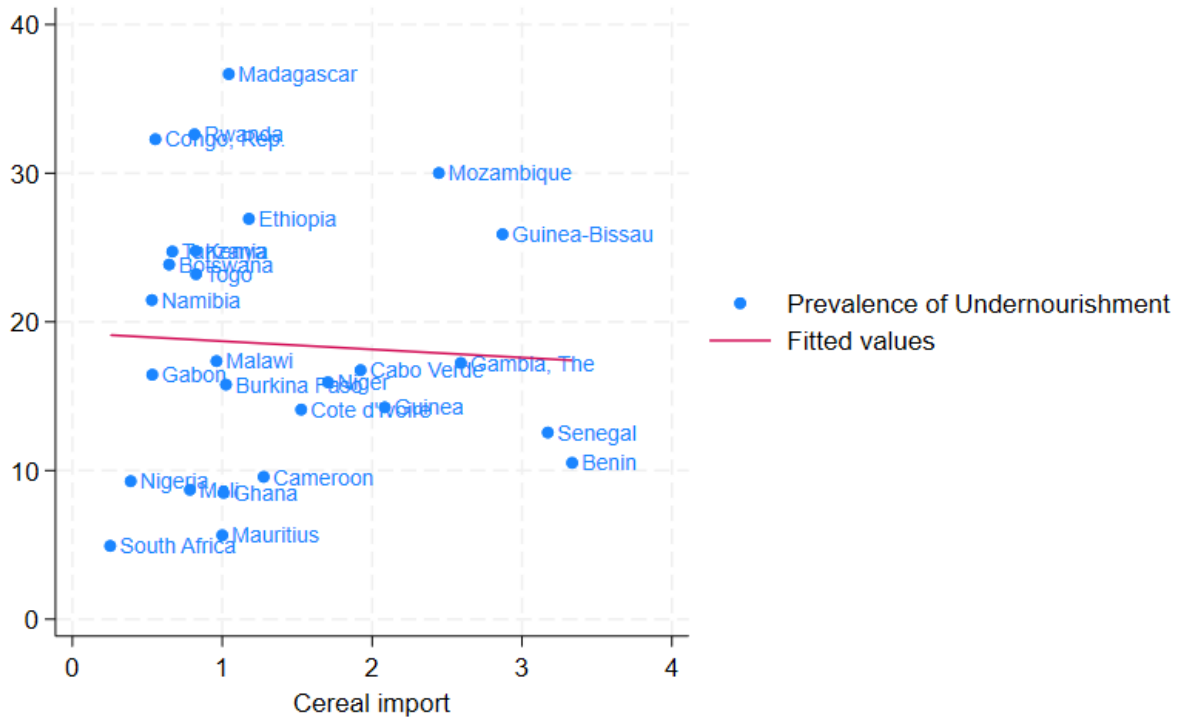
Source: FAOSTAT

2.4.5 Relationship between cereal import and food security

The following figure (Figure 2.8) illustrates the relationship between cereal import openness and the prevalence of undernourishment. The fitted line in the graph suggests a slight negative correlation between cereal import openness and the prevalence of undernourishment. As cereal import openness increases, the prevalence of undernourishment tends to decrease slightly. However, the relationship appears to be weak, as indicated by the almost flat slope of the

fitted line. And as correlation does not necessarily mean causality, we will provide empirical evidence in this study.

Figure 2.8: Cereal Import Openness and Prevalence of Undernourishment



Source: Author's construction

2.5 Data description and methodology

2.5.1 Data

Based on the previous literature and data availability, we used panel data for 27 Sub-Saharan African countries covering the period 2000 - 2020. The data used in the study come from the World Bank's World Development Indicators (WDI) database, the EM-DAT ⁵ database and the FAO's FAOSTAT.

2.5.1.1 Food security indicator and measuring cereal import openness

Food security is a multidimensional concept. Indeed, it can be divided into four dimensions namely the availability, access, utilization, and stability. There is no single indicator representing all the dimensions at once. However, based on the research question, and the availability of the data, we measure food security using the prevalence of undernourishment from the FAOSTAT

⁵The Emergency Events Database, by the Centre for Research on the Epidemiology of Disasters (CRED), part of the University of Louvain (UCLouvain)

in our study. The prevalence of undernourishment is defined as the proportion of the population whose habitual food consumption is insufficient to provide the dietary energy levels required to maintain normal activity and healthy life. This indicator provides insights into the number of individuals who do not have access to sufficient food to meet their basic nutritional needs. In our study, using the prevalence of undernourishment is relevant because it allows us to see the immediate impact of cereal trade on the number of people suffering from undernourishment. In addition, this indicator is usually chosen in the literature on food security ([Bonuedi et al., 2020](#); [Marson et al., 2023](#); [Mary, 2019](#)). This indicator has also been used by the MDG and SDG initiatives to monitor the global fight against hunger ([Marson et al., 2023](#); [Mary, 2019](#)).

In our analysis, we construct a measure of cereal trade using data on imports of cereals from the FAO database and GDP to measure country's cereal import openness. Cereal import openness is measured by a country's cereal imports as a percentage of GDP. The two sides of trade can affect differently food security and in our analysis, we decide to focus on cereal imports. This approach provides specific insights into a country's dependence on external sources for its food supply and how external dependencies shape food availability, accessibility, and affordability, informing more effective and resilient food security strategies. Also, nearly all Sub-Saharan African countries are net importers of cereals. So by focusing on cereal import openness, we aim to quantify the impact of this dependency on food security. Understanding the implication of cereal import openness is also essential to formulate effective trade policies. Considering cereal imports has been done in other studies such as [Marson et al. \(2023\)](#).

2.5.1.2 Control variables

We include several control variables usually used in the food security literature to account for various factors that may influence food security such as economic factor, agricultural factor, climate factor, demographic factor, and political factor.

(i) **GDP growth.** The annual percentage growth rate of GDP is used for the level of economic development as in [Dithmer and Abdulai \(2017\)](#). A negative relationship between GDP growth and the prevalence of undernourishment is expected since higher income levels generally increase the ability to purchase food and then reduce the number of people undernourished. Data for GDP growth are from the World Bank WDI database.

(ii) **Cereal yield.** The average cereal yield in kg per ha is used as in [Dithmer and Abdulai \(2017\)](#), [Bonuedi et al. \(2020\)](#) and [Marson et al. \(2023\)](#) to measure the agricultural productivity and is expected to positively affect food security. A negative sign with the prevalence of undernourishment is expected. Data for cereal yield are from the World Bank WDI database.

(iii) **Arable land.** The arable lands in percentage of land area ([Dithmer and Abdulai, 2017](#);

[Marson et al., 2023](#)) is used as measure of the lands used for crops and is also expected to affect positively food security. In our case we expect a negative sign with our measure of food security. Data for arable land are from the World Bank WDI database.

(iv) **Political stability.** To account for the impacts of conflicts, we use the political stability and absence of violence indicator from the World Governance Indicators database. A higher level in this indicator means more political stability and absence of violence. We expect this variable to have a positive impact as better stability and the absence of conflicts should be beneficial to food security. In our case, a negative sign is expected.

(v) **Natural disasters.** To control for the effect of climate on food security, a measure of the percentage of the population affected by natural disasters is used. We use data from the Emergency Events Database (EM-DAT) ⁶. The variable is computed as the number of people affected by natural disasters divided by the total population as in [Dithmer and Abdulai \(2017\)](#).

(vi) **Employment.** We also control for the level of employment in agriculture as this sector is very essential for the improvement of food security level in Sub-Saharan Africa. Data for employment in agriculture are from the World Bank WDI database.

(vii) **Population growth.** The annual population growth rate is used to control for demographic impact as in [Bonuedi et al. \(2020\)](#) and [Dithmer and Abdulai \(2017\)](#). Data for population growth are from the World Bank WDI database.

(viii) **Inflation.** The inflation as measured by the consumer price index is used to control for the quality of the macroeconomic environment as in [Bonuedi et al. \(2020\)](#) and [Dithmer and Abdulai \(2017\)](#). We expect a positive sign as an increase in prices should lead to higher levels of food insecurity. Data for inflation are from FAOSTAT.

Table 2.1 reports the summary statistics of the variables employed. The list of countries used in the analysis and the list of variables and their sources are presented in appendix.

⁶Natural disaster comprise geophysical, meteorological, hydrological, climatological, and biological disasters (see <http://www.emdat.be/>).

Table 2.1: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Prevalence of Undernourishment (%)	567	18.51	9.74	3.4	49.5
Cereal import openness	567	1.33	1.15	0.05	9.07
Terms of trade (index)	567	95.39	18.41	18.69	158.06
Real exchange rate (index)	567	629.68	1229.31	0.544	9565.08
GDP growth	567	4.28	3.92	-20.80	15.37
Cereal yield (kg per ha)	567	1549.47	1257.22	0.1	9453.7
Arable land (% of land area)	567	17.03	14.26	0.32	525.24
Population growth	567	2.48	0.73	0.002	4.15
Political stability	540	-0.35	0.82	-2.40	1.22
Employment in agriculture	567	50.30	21.04	5.31	89.09
Inflation	554	5.89	6.34	-8.23	44.35
Natural disasters	544	0.54	3.29	0	43.33

2.5.2 Methodology

Our objective is to empirically analyse the impact of cereal trade openness on the prevalence of undernourishment in SSA. Following the model developed by [Bonuedi et al. \(2020\)](#) and [Mary \(2019\)](#), we are using the following fixed effects model:

$$PoU_{i,t} = \alpha + \beta_1 CIO_{i,t} + \beta_2 X_{i,t} + \rho_i + \epsilon_{i,t} \quad (2.1)$$

where $PoU_{i,t}$ represents the prevalence of undernourishment of country i in year t ; $CIO_{i,t}$ is the cereal import openness; $X_{i,t}$ is a vector of control variables namely the GDP per capita, cereal yield, arable land, urbanization, political stability, employment in agriculture, food price inflation and natural disasters; ρ_i captures country-specific effects; $\epsilon_{i,t}$ is the error term.

Following the literature ([Dithmer and Abdulai, 2017](#); [Marson et al., 2023](#); [Mary, 2019](#)), we acknowledge the potential endogeneity problem mentioned by previous studies on the relationship between trade and food security. Endogeneity can arise because of the reverse causality. Indeed, government actors can base their choices about cereal imports according to the levels of food insecurity in their countries.

In order to address this potential endogeneity, several econometric techniques can be used. One of these methods is the Generalized Method of Moments (GMM) estimator, as used by [Dithmer and Abdulai \(2017\)](#), which employs lagged values of explanatory variables as instruments. However, this method has been criticized for the possible weakness of instruments and its need for a large sample ([Arellano and Bond, 1991](#)).

An alternative approach is the instrumental variable approach used by [Mary \(2019\)](#), [Marson et al. \(2023\)](#) and [Bonuedi et al. \(2020\)](#). In our paper we perform the Instrumental Variable Two-Stages Least Squares (IV-2SLS) and control for country and time fixed effects. This estimation technique is well suited to analyze structural equations that suffer from the problem of endogeneity, resulting from reverse causality between the dependent and the independent variables, and/or from omitted variable bias, and/or from measurement errors ([Murshed, 2020](#)). The main challenge in this approach is to find a good instrument for cereal trade, which must be correlated with cereal trade openness, exogenous to the prevalence of undernourishment, and relevant. [Mary \(2019\)](#) used rainfall anomalies as an instrument and [Marson et al. \(2023\)](#) used a measure of rest of the world trade openness as an instrument for trade openness. In their analysis, [Bonuedi et al. \(2020\)](#) used an instrument based on the distances between countries. They used the distance to the frontier (DTF) score of trading across borders.

To address this issue, we use two instruments in our analysis: the terms of trade and the real exchange rate as in [Murshed \(2020\)](#). The terms of trade is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes. It is the ratio of a country's export prices to its import prices. The real exchange rate is the nominal effective exchange rate divided by a price deflator or index of costs. It adjusts the nominal exchange rate by relative price levels between countries, reflecting the competitiveness of a country's goods and services. Our instruments need to satisfy several requirements to be considered as plausible. When it comes to the relevance requirements, favorable terms of trade (higher terms of trade) mean that a country can obtain more imports for a given amount of exports, potentially increasing the volume of cereal imports. Concerning the real exchange rate, it affects the trade balance by influencing the relative prices of exports and imports, which in turn impacts cereal import levels. And when it comes to the exogeneity of our instruments, terms of trade is influenced by global commodity prices and external economic conditions rather than domestic cereal import policies or food security directly. Thus, it is likely to be exogenous to the prevalence of undernourishment. And concerning the real exchange rate, the fluctuations are driven by a variety of macroeconomic factors, such as inflation rates and monetary policies, rather than direct influences from domestic cereal import policies or food security status. As in [Murshed \(2020\)](#), we are using the natural logarithm of terms of trade and real exchange rate in our analysis.

However, we acknowledge that finding a proper instrument that meets the exogenous and endogenous criteria is a challenge. We verify the endogeneity of cereal import openness and the relevance of our instruments. The first stage of the IV-2SLS estimation is also investigated.

2.6 Results and discussion

2.6.1 Cereal import openness and food security

In this section, we present and discuss the empirical results from the cereal trade and food security regression. It is important to remember that we use the prevalence of undernourishment as a measure of food security. So, high level of this variable means less food security as the number of people undernourished will increase. So for the interpretation of the sign of the coefficients, negative signs mean an improvement of food security as we will have less people undernourished. The results of the first-stage regression are presented in Table 2.5 in appendix.

The second stage results showing the impact of cereal import openness on the prevalence of undernourishment are presented in Table 2.2. An endogeneity test is performed and confirm that cereal import openness is endogenous, hence the use of an instrumental variable estimator. The validity of our proposed instruments is assessed via the Anderson conical correlation Lagrangian Multiplier (LM) test for under-identification and Cragg-Donald Wald F test for weak identification. The Sargan statistic for the overidentification of the instruments is also displayed.

Turning to the results, cereal import openness is positive and statistically significant. An increase in cereal import openness is associated with an increase in the prevalence of undernourishment. Higher cereal import openness is associated with increased prevalence of undernourishment and then unfavorable to food security improvement. This finding is in line with [Mary \(2019\)](#), [Tanaka and Hosoe \(2011\)](#), [Moon \(2011\)](#) and [Kang \(2015\)](#). This finding implies that greater reliance on cereal imports, may lead to higher levels of undernourishment, probably due to the vulnerability of Sub-Saharan African countries to global market fluctuations, price volatility, and supply chain disruptions. In line with our expectations, we find that GDP growth, cereal yield and arable land are statistically significant and negatively correlated with the prevalence of undernourishment. An increase of the income and level of development is associated with a decrease of undernourishment. Higher economic resources are associated with higher levels of food security. This has been found by previous studies like [Dithmer and Abdulai \(2017\)](#) and [Marson et al. \(2023\)](#). Cereal yield coefficient is negative and statistically significant suggesting that increased agricultural productivity can lead to greater food availability and improved food security, reducing undernourishment rates. This has been found by previous

studies like [Dithmer and Abdulai \(2017\)](#) and [Marson et al. \(2023\)](#). Arable land is also negatively correlated with undernourishment suggesting that higher level in arable land is associated with higher level of food security. An improvement of the agricultural sector is therefore essential for food security improvement. These findings are in line with the literature ([Bonuedi et al., 2020](#); [Dithmer and Abdulai, 2017](#); [Marson et al., 2023](#)). Employment coefficient is positively and significantly associated with undernourishment indicating that that higher employment levels are associated with higher undernourishment. This finding might suggest that while employment rates are increasing, the quality of jobs may be low, leading to insufficient income to combat undernourishment.

The population growth has been found to be significant and positively correlated with undernourishment. An increase in population growth is then associated with more undernourishment. Rapid population growth can strain food supply systems and increase demand pressures, making it difficult to ensure adequate food distribution and access, thereby exacerbating malnutrition. This has been found by previous studies like [Dithmer and Abdulai \(2017\)](#). However, we didn't find significant evidence concerning the impact of natural disasters, inflation and political stability.

Table 2.2: Cereal import openness and Undernourishment

VARIABLES	2SLS-IV
Cereal import openness	3.354** (1.699)
GDP growth	-0.182*** (3.654)
Cereal yield	-0.0006** (0.0002)
Arable land	-0.526*** (0.139)
Political stability	0.913 (0.572)
Inflation	-0.020 (0.054)
Population growth	1.965** (0.974)
Employment	0.420*** (0.083)
Natural disasters	-0.053 (0.064)
Constant	-9.351 (8.677)
Country fixed effect	YES
Year fixed effect	YES
Number of countries	27
Number of observations	507
Endogeneity test	0.0264
Cragg-Donald Wald F statistic	7.365
Anderson LM statistic (p value)	0.0002
Hansen J statistic (p value)	0.907

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

2.6.2 Robustness check

2.6.2.1 Alternative food security indicators

In order to make sure that our findings are robust, we repeat the analysis using alternative food security indicators, the average dietary energy supply adequacy and the average protein supply from the FAOSTAT. The average dietary energy supply adequacy represents the average availability of dietary energy in a country relative to the average dietary energy requirement of its population. It is a useful indicator for assessing food security and nutritional well-being. An increase in the average dietary energy supply adequacy indicator typically signifies an improvement in food security.

Table 2.3 shows the results for the average dietary energy supply adequacy as food security indicator employing the same empirical specification as in our baseline model, the two stage least square instrumental variable estimator. The result shows that cereal import openness affects negatively and significantly the average dietary energy supply adequacy of a country. This finding suggests that higher cereal import openness is associated with decreased dietary energy supply adequacy. This additional result confirms the finding of our baseline model on the adverse effects of cereal import openness on food security.

We also use a third food security indicator, the average protein supply available for consumption from the FAOSTAT. Protein is one of the major macronutrient groups and most of the poor countries remain close to the lower bound of the FAO recommended daily value ([Dithmer and Abdulai, 2017](#)). An increase in protein consumption then suggest a food security improvement. Unfortunately, this indicator is only available until 2018 and doesn't cover all of our period of study. However, given the relevance of this measure and the clear link with cereal trade, we repeat the analysis using the average protein supply as a measure of food security on a reduced sample. The results showed in Table 2.6 in appendix show that cereal import openness lead to a decrease in the average protein supply available for consumption. This is likely to lead to an increase in undernutrition and then improve food insecurity.

Table 2.3: Cereal import openness and Dietary Energy Supply Adequacy

VARIABLES	(1)
	2SLS-IV
Cereal import openness	-4.290** (2.059)
GDP growth	0.210*** (0.075)
Cereal yield	0.0008*** (0.0003)
Arable land	0.596*** (0.170)
Political stability	-1.472** (0.741)
Inflation	-0.043 (0.063)
Population growth	-0.713 (1.092)
Employment	-0.397*** (0.103)
Natural disasters	0.034 (0.093)
Constant	134.393*** (10.379)
Country fixed effect	YES
Year fixed effect	YES
Number of countries	27
Number of observations	507
Endogeneity test	0.0090
Cragg-Donald Wald F statistic	7.365
Anderson LM statistic (p value)	0.0002
Hansen J statistic (p value)	0.983
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

2.6.2.2 Weighted regression

In addition to our primary analysis, we also consider the impact of cereal import openness under conditions of high global food prices. To do this, we run importance weighted (iweight)

regressions using the FAO Food Price Index⁷ (FFPI) as the weight. By assigning higher weights to observations associated with higher food prices, we estimate the trade effect primarily from years in which food prices were high. This approach provides valuable insights into the vulnerability of Sub-Saharan African countries to global market fluctuations and the associated impact on food security. Results are display in Table 2.4. This regression results suggests that during years when food prices are high, greater reliance on cereal imports exacerbates undernourishment possibly due to higher import costs or supply vulnerability. This confirm the finding of our baseline model.

⁷The FFPI is a measure of the monthly change in international prices of a basket of food commodities. It consists of the average of five commodity group price indices weighted by the average export shares of each of the groups over 2014-2016

Table 2.4: Cereal import openness and Undernourishment (Weighted regression)

VARIABLES	2SLS-IV
Cereal import openness	3.472*** (0.185)
GDP growth	-0.161*** (0.063)
Cereal yield	-0.0006*** (0.00004)
Arable land	-0.524*** (0.014)
Political stability	0.651*** (0.059)
Inflation	-0.011** (0.006)
Population growth	1.907*** (0.093)
Employment	0.402*** (0.009)
Natural disasters	-0.042*** (0.008)
Constant	-9.386*** (0.940)
Country fixed effect	YES
Year fixed effect	YES
Endogeneity test	0.0000
Cragg-Donald Wald F statistic	640.486
Anderson LM statistic (p value)	0.0000
Hansen J statistic (p value)	0.101
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

2.6.2.3 Heterogeneity Across Economic Development Levels

To test the robustness of our results, we examine whether the impact of cereal import openness on undernourishment differs between low-income and middle-income countries. Economic structure, trade dependence and agricultural resilience differ across income levels, potentially altering the impact of trade openness on food security.

Table 2.5 presents the results for low-income countries. The coefficient for cereal import

openness is positive and significant, suggesting that greater cereal import dependency may worsen food security. The coefficient is higher than in the baseline regression. This aligns with the argument that low-income economies are more vulnerable to external shocks and price volatility in global food markets. Table 2.6 presents the results for middle-income countries. The results suggest that cereal import openness may have a beneficial effect in middle-income economies. However, we didn't find statistically significant results. The findings are then inconclusive.

These findings support the idea that cereal trade liberalization does not have the same impact on all economies. Low-income countries may suffer from the risks of import dependence, while middle-income countries may be better positioned to use trade to improve food security.

Table 2.5: Cereal import openness and Undernourishment (Low-income countries)

VARIABLES	2SLS-IV
Cereal import openness	9.408* (5.330)
GDP growth	-0.358* (0.192)
Cereal yield	-0.0004 (0.0025)
Arable land	-0.674 (0.511)
Political stability	-1.258 (1.816)
Inflation	-0.037 (0.107)
Population growth	3.150 (3.179)
Employment	0.161 (0.154)
Natural disasters	-0.191 (0.131)
Constant	6.169 (18.390)
Country fixed effect	YES
Year fixed effect	YES
Number of countries	13
Number of observations	243
Endogeneity test	0.0032
Cragg-Donald Wald F statistic	1.744
Anderson LM statistic (p value)	0.076
Hansen J statistic (p value)	0.953
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 2.6: Cereal import openness and Undernourishment (Middle-income countries)

VARIABLES	2SLS-IV
Cereal import openness	-10.103 (7.973)
GDP growth	-0.126 (0.092)
Cereal yield	-0.0002 (0.0003)
Arable land	-0.477 (0.292)
Political stability	-0.924 (1.189)
Inflation	0.062 (0.064)
Population growth	0.106 (1.449)
Employment	0.161 (0.224)
Natural disasters	0.009 (0.852)
Constant	24.039** (10.821)
Country fixed effect	YES
Year fixed effect	YES
Number of countries	12
Number of observations	226
Endogeneity test	0.2780
Cragg-Donald Wald F statistic	1.158
Anderson LM statistic (p value)	0.174
Hansen J statistic (p value)	0.201
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

2.6.2.4 The Role of Cereal Trade Dependence

We also explore whether the relationship between cereal import openness and undernourishment differs between net cereal importers and net cereal exporters. Countries that rely heavily on cereal imports to meet domestic food demand may be more vulnerable to global price

fluctuations, trade restrictions, and supply chain disruptions, while countries that produce and export cereals may benefit from trade openness, as it allows them to expand market access and enhance food availability through comparative advantage mechanisms.

For net cereal importers (Table 2.7), the coefficient on cereal import openness is positive and significant. This suggests that higher cereal import openness is associated with increased undernourishment, implying that trade dependency may exacerbate food insecurity. The results align with the argument that import-dependent economies face greater risks from global food price volatility and external shocks, making them more vulnerable to food insecurity when cereal imports fluctuate. For net cereal exporters (Table 2.8), the coefficient on cereal import openness is negative and statistically significant, indicating that higher cereal import openness is associated with lower undernourishment, and suggesting that trade benefits countries with strong agricultural export sectors.

Table 2.7: Cereal import openness and Undernourishment (Net cereal importers)

VARIABLES	2SLS-IV
Cereal import openness	3.121* (1.836)
GDP growth	-0.346*** (0.100)
Cereal yield	-0.0035*** (0.0012)
Arable land	-0.866*** (0.273)
Political stability	0.530 (0.644)
Inflation	-0.064 (0.053)
Population growth	1.969 (1.537)
Employment	0.265** (0.121)
Natural disasters	-0.122** (0.062)
Constant	10.950 (15.818)
Country fixed effect	YES
Year fixed effect	YES
Number of countries	19
Number of observations	357
Endogeneity test	0.032
Cragg-Donald Wald F statistic	3.846
Anderson LM statistic (p value)	0.0032
Hansen J statistic (p value)	0.254

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.8: Cereal import openness and Undernourishment (Net cereal exporters)

VARIABLES	2SLS-IV
Cereal import openness	-19.655** (9.988)
GDP growth	-0.018 (0.107)
Cereal yield	-0.00013 (0.0003)
Arable land	-0.089 (0.427)
Political stability	0.027 (1.977)
Inflation	-0.086 (0.195)
Population growth	2.866** (1.145)
Employment	-0.067 (0.349)
Natural disasters	0.289 (0.897)
Constant	27.267** (13.748)
Country fixed effect	YES
Year fixed effect	YES
Number of countries	7
Number of observations	131
Endogeneity test	0.129
Cragg-Donald Wald F statistic	1.560
Anderson LM statistic (p value)	0.101
Hansen J statistic (p value)	0.221

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

2.7 Conclusion and Policy Implications

In this study, we used panel data to analyze the impact of cereal import openness on food security (measured by the prevalence of undernourishment) in Sub-Saharan Africa for the period 2000 - 2020. We employed a two stage least square instrumental variable (2SLS-IV) estimator to deal with potential endogeneity and we control for country and year fixed effects. The results showed that cereal import openness have a positive and statistically significant impact on the prevalence of undernourishment suggesting that cereal import openness increase the prevalence of undernourishment and then improve food insecurity. This finding is in line with [Mary \(2019\)](#), [Tanaka and Hosoe \(2011\)](#), [Moon \(2011\)](#) and [Kang \(2015\)](#). The negative effect of cereal import openness on food security remain significant and consistent with alternative food security indicators such as dietary energy supply adequacy as well as the average protein supply available for consumption, representing other aspects of food security.

Besides that, the economic and agricultural factors have been found to affect positively food security. In fact, GDP growth, cereal yield and arable land variables have a positive impact on food security regardless of the indicator used. On the contrary, employment in agriculture, the population growth negatively affect food security.

In terms of policy implications, several recommendations can be made based on the empirical results. Our results have pointed out the adverse effect of cereal import openness on food security. A great reliance on imports then exposes countries to global market risks. Policies should aim to balance imports with increased domestic production. This could include incentives for local cereal production and reducing barriers to entry for small-scale farmers. While imports are necessary, the negative impact on food security indicates a need for careful management of trade policies. Governments should negotiate favorable trade agreements that ensure stable and affordable cereal supplies. Diversifying import sources and creating regional trade partnerships can also reduce dependency on a single market. The negative and significant relationship between cereal yield and undernourishment underlines the importance of increasing domestic agricultural productivity. Governments should invest in agricultural research and development, subsidise high-yielding and resilient crop varieties, and promote modern farming techniques. Extension services that provide training and resources to farmers can also increase productivity. Land reform policies that provide secure land tenure and access to arable land for smallholders are also essential. In addition, investment in irrigation and infrastructure can make more land suitable for farming. By enhancing domestic agricultural productivity, reducing dependency on cereal imports and promoting economic growth, governments can address undernourishment and help build more resilient and food secure countries.

2.8 Appendix

Table 2.9: First-stage regression results

VARIABLES	Dependent variable : Cereal import
Terms of trade (log)	-0.522*** (0.144)
Real exchange rate (log)	-0.440*** (0.129)
GDP growth	0.007 (0.008)
Cereal yield	-0.0001*** (0.00003)
Arable land	0.061*** (0.016)
Political stability	-0.037 (0.080)
Inflation	-0.015** (0.006)
Population growth	-0.090 (0.085)
Employment	-0.035*** (0.012)
Natural disasters	0.021** (0.011)
Constant	8.687*** (1.752)
Observations	507
R-squared	0.66

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: Terms of trade and real exchange rate represent the instruments

Table 2.10: Cereal import openness and Average Protein Supply

VARIABLES	(1)
	2SLS-IV
Cereal import openness	-2.127*
	(1.180)
GDP growth	0.060
	(0.049)
Cereal yield	0.0003
	(0.0001)
Arable land	0.278**
	(0.105)
Political stability	0.171
	(0.380)
Inflation	-0.006
	(0.361)
Population growth	-0.429
	(0.578)
Employment	-0.168**
	(0.067)
Natural disasters	0.010
	(0.051)
Constant	-65.710***
	(6.309)
Country fixed effect	YES
Year fixed effect	YES
Number of countries	27
Number of observations	476
Endogeneity test	0.0096
Cragg-Donald Wald F statistic	6.419
Anderson LM statistic (p value)	0.0006
Hansen J statistic (p value)	0.334

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.11: List of Countries (27)

Benin	Madagascar
Botswana	Malawi
Burkina Faso	Mali
Cabo Verde	Mauritius
Cameroon	Mozambique
Congo, Rep	Namibia
Cote d'Ivoire	Niger
Ethiopia	Nigeria
Gabon	Rwanda
Gambia	Senegal
Ghana	South Africa
Guinea	Tanzania
Guinea-Bissau	Togo
Kenya	

Table 2.12: Variables and data source

Variables	Source
Prevalence of Undernourishment (%)	FAO
Average protein supply (g/capita/day)	FAO
Average dietary energy supply adequacy (%)	FAO
Cereal import openness	FAO
Inflation	World Bank WDI
GDP growth	World Bank WDI
Cereal yield	World Bank WDI
Arable land	World Bank WDI
Population growth	World Bank WDI
Employment in agriculture	World Bank WDI
Political stability and absence of violence	World Bank WGI
Natural disasters	EM-DAT
Net barter terms of trade index	World Bank WDI
Real effective exchange rate index	World Bank WDI

Chapter 3

Do tariff reductions alleviate Energy Poverty? Evidence for Sub-Saharan African countries

Abstract: Energy poverty is a topical issue in developing countries and its alleviation is one of the United Nations's Sustainable Development Goals (SDG7). In this paper, we analyze the impact of trade liberalization measured by tariff rate reductions on energy poverty as determined by access to clean fuels and modern technologies for cooking. We use panel data of 20 Sub-Saharan African countries from 2000 - 2020, a dynamic ordinary least squares (DOLS) estimator, a fully modified ordinary least squares (FMOLS) and a canonical correlation regression (CCR) to capture the long-running relationship. We found that tariffs rate reductions are associated with an increase in access to clean fuels and modern technologies for cooking, which in the long-run helps to alleviate energy poverty. Our empirical findings are robust according to several tests, including adding alternative control variables, alternative energy poverty measure, and alternative empirical methods. Our analysis also highlights that renewable energy consumption, remittances and institutional quality help alleviate energy poverty.

Keywords: Energy poverty, Trade liberalization, Tariff rates, Sustainable Development Goals, Sub-Saharan Africa

3.1 Introduction

Energy poverty is a topical issue in developing countries and its alleviation is one of the objectives of the United Nations’ Sustainable Development Goals (SDGs). SDG 7 specifically aims to ensure access to affordable, reliable, sustainable and modern energy for all ¹. There are many different definitions and visions of energy poverty. For example, energy poverty can be defined as “the absence of sufficient choice in accessing adequate, affordable, reliable, high-quality, safe and environmentally benign energy services to support economic and human development” (Reddy et al., 2000). However, all definitions refer to a level of energy consumption that is insufficient to meet certain basic needs (González-Eguino, 2015), and the inability of households to meet their personal requirements. Moreover, energy poverty is an issue for developed and developing countries, but in different contexts (Sy and Mokaddem, 2022; Zhang et al., 2019a). Energy poverty in developed countries is linked to issues of affordability and energy efficiency (Bonatz et al., 2019). In the developed countries, there is a higher level of infrastructure coverage and more equitable access to modern sources of energy (Halkos and Gkampoura, 2021). However, energy poverty in developing countries refers to a lack of access to modern energy sources, which are needed to provide modern energy services (Li et al., 2014; Lin and Wang, 2020).

Despite a move toward sustainable energy targets, the pace remains slow. By 2030, about 660 million people worldwide will still have no access to electricity and close to 2 billion people will continue to rely on polluting fuels and technologies for cooking ². The COVID-19 crisis and Russia’s invasion of Ukraine have driven increases in energy prices creating a global cost-of-living crisis affecting billions of people. In addition, energy poverty has become a concern for policy makers.

Energy poverty affects many sectors of the economy and hinders environmental efforts, but the most significant impacts are on health and education (Djeunankan et al., 2023). In fact, as indicated in Figure 1, energy poverty affects several sectors of the economy such as agriculture, industry, economic growth, household, education and healthcare. In the agricultural sector, energy poverty can reduce productivity due to the lack of reliable electricity, which affects irrigation, mechanization and storage facilities. This reduction of agricultural output directly affects food availability and affordability, leading to increased food insecurity. In the industrial sector, energy poverty can lead to reduced production efficiency and low competitiveness due to high energy costs and lack of reliable and consistent energy. From an economic growth perspective, energy poverty discourages investment and limits industrial expansion and new business creation, leading to fewer job opportunities. Concerning the households, energy poverty

¹United Nations 2030 Agenda for Sustainable Development

²The Sustainable Development Goals Report 2023: Special Edition

forces households to rely on more expensive and less efficient energy sources, leading to higher overall living costs for poor families. Reliance on traditional biomass for cooking and heating leads to indoor air pollution, causing respiratory, cardiovascular and other health problems. The World Health Organisation estimates that around 3.8 million people die each year from illnesses related to household air pollution³. Concerning education, energy poverty can disrupt learning and reduce attendance because without electricity there is a lack of proper lighting, heating and cooling, which affects students' ability to learn. Energy poverty also forces children to spend time collecting fuel for household needs, reducing their school attendance. In the healthcare sector, facilities without reliable electricity face operational difficulties, such as the inability to power essential medical equipment, which limits their ability to provide quality healthcare. Poor air quality from burning biomass fuels can lead to respiratory diseases, while lack of clean water due to inadequate water treatment (often dependent on electricity) increases the prevalence of waterborne diseases.

Some efforts have been made to improve electricity access and increase the share of population with access to clean fuels and technologies for cooking (IEA, 2017). The global electricity access rate increased from 87% in 2015 to 91% in 2021, serving close to an additional 800 million people⁴. The share of the population with access to clean fuels and technologies for cooking increased from 49% to 60% between 2000 and 2016 (WorldBank, 2012), while household electricity consumption increased by over 50% between 1985 and 2019. However, despite this progress, the situation is still worrisome in developing countries, especially in Sub-Saharan Africa (SSA) where 567 million people did not have access to electricity in 2021. We also denote the disparities between the rural and urban population in developing countries. Alleviating energy poverty and increasing access to electricity can improve health care, education quality, create more jobs, support the agriculture development and improve economic development.

The determinants of energy poverty alleviation have been a subject of great interest. Studies have analyzed the impact of factors such as remittances, income inequality, natural resources, renewable energy consumption, democracy, institutional quality, education, government spending and energy efficiency (Ahlborg et al., 2015; Djeunankan et al., 2023; Dong et al., 2022; Dong and Hao, 2018; Nguyen and Nasir, 2021; Nguyen and Su, 2022; Zhao et al., 2022).

However, the impact of trade liberalization has been less explored. Theoretically speaking, according to the Heckscher-Ohlin model, countries export goods that use their abundant factors of production and import goods that use their scarce factors. In the context of Sub-Saharan Africa, this model suggests that reducing import tariffs can lower the cost of clean energy technologies, making them more accessible. In addition, the endogenous growth theory suggests

³WHO (2018)

⁴The Sustainable Development Goals Report 2023: Special Edition

that trade openness promotes innovation and technology transfer, leading to economic growth (Romer, 1990). This growth can provide the resources needed to improve energy infrastructure and access. The Stolper-Samuelson theorem supports this by showing that trade liberalization benefits the factor of abundance, which in many developing countries is labour (Stolper and Samuelson, 1941). Increased employment and income from trade can enable households to afford cleaner energy sources. The energy ladder hypothesis suggests that as household incomes rise, they move from traditional biomass fuels to modern energy sources, reducing energy poverty (Hosier and Dowd, 1987).

Trade liberalization can then have a positive impact on energy poverty on the one hand, by increasing access to affordable energy sources, facilitating imports of energy products, and increasing the availability of energy for households and industries. Trade liberalization can attract foreign investors in the energy sector and lead to the development of an energy infrastructure, thus increasing access to electricity. It can also lead to energy diversification by allowing access to a broader range of technologies and fuels.

On the other hand, trade liberalization can have a reverse impact on energy poverty by creating a dependence and overreliance on imported energy, making countries vulnerable to market fluctuations. It can also reduce energy subsidies and lead to higher energy prices for consumers.

In addition, given the current situation in Africa and the establishment of the African Continental Free Trade Area (AfCFTA) in 2018, there is a real opportunity for Sub-Saharan African countries to reduce energy poverty by diversifying sources of supply. In fact, in 2018, the creation of AfCFTA established the world's largest free trade area by population (1.3 billion) with a combined gross domestic product (GDP) of \$3 trillion as of 2022 (ElGanainy et al., 2023). The implementation of AfCFTA is expected to lead to a significant reduction in tariff and non-tariff measures between countries and increase the trade flow. It is, therefore, important to analyze the impact of trade liberalization on energy poverty alleviation.

The objective of this study is to analyze the impact of trade liberalization on energy poverty alleviation in SSA. Tariff rates will be used as the main measure of trade liberalization. Trade liberalization refers to the removal or reduction of trade barriers, such as tariffs, quotas and regulations, to facilitate the freer flow of goods and services between countries. Among these barriers, tariff rates are often highlighted as a critical measure because of their direct impact on trade costs and volumes (Bureau et al., 2019; Ju et al., 2010; Santos-Paulino, 2002). This is the reason why we are in favour of this measure. Tariffs directly increase the cost of imported goods, making them less competitive with domestic products. Reducing tariff rates lowers these costs, thereby encouraging imports and exports.

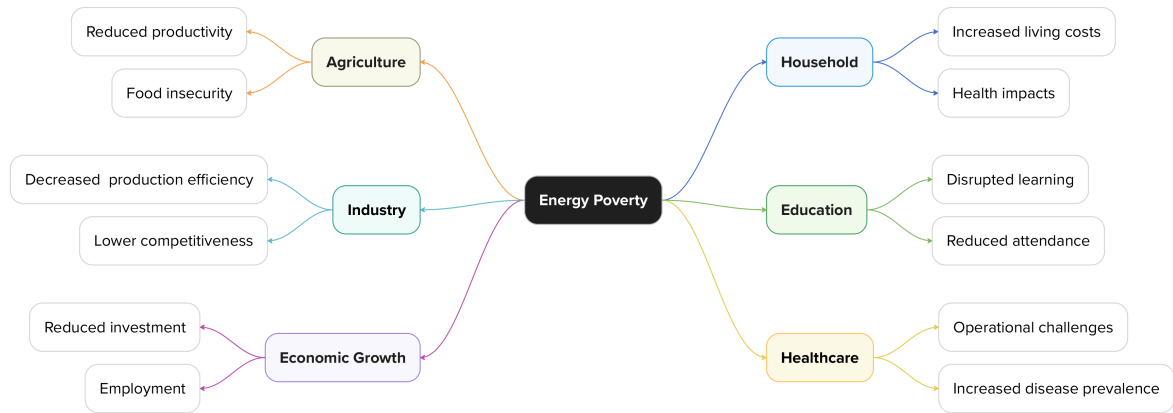
This research aims to evaluate the impact of tariff rate reductions on energy poverty measured by the access to clean fuels and modern technologies for cooking. Specifically, our study aims to test the following hypothesis derived from theoretical frameworks: **(H1)**: Reductions in tariff rates are positively associated with increased access to clean fuels and modern technologies for cooking. Second, we analyze the other determinants of energy poverty in SSA. This study focuses on Sub-Saharan African countries because of the low access to electricity and inefficient cooking system in the region. In 2021, 675 million people still lived in the dark with four out of five located in SSA⁵, and the growing population in this region increases the number of people without access to electricity. A total of 567 million of people were without access in 2021 (in SSA)⁶. To the best of our knowledge, there are no empirical studies analyzing the impact of trade liberalization on energy poverty in SSA; therefore the contributions of this research are multiple. Firstly, despite the growing empirical literature on energy poverty, SSA has received scant attention. Secondly, we complete the literature on energy poverty by providing an empirical analysis of the impact of trade liberalization.

The remainder of the paper is organized as follows. Section 3.2 presents the literature review. Section 3.3 presents some stylized facts about energy poverty trends in Sub-Saharan Africa. Section 3.4 describes the data and the methodology used. Section 3.5 presents the empirical findings and discusses the results. Section 3.6 presents some robustness tests and section 3.7 concludes the paper.

⁵United Nations 2030 Agenda for Sustainable Development

⁶The Sustainable Development Goals Report 2023: Special Edition

Figure 3.1: Impact of energy poverty on economic sectors



Source: Author's construction

3.2 Literature review

Energy poverty has received less attention in past decades compared to climate change and security of supply ([González-Eguino, 2015](#)). However, given its significant impact on the lives of people, there is growing in an effort to tackle the problem of energy poverty and analyze the determinants of this global problem.

3.2.1 Energy poverty overview

There are different definitions and visions of poverty ([González-Eguino, 2015](#)). However, energy poverty can be defined as the lack of basic needs in term of energy requirements. In the literature, energy poverty is measured using three different but complementary approaches ([Pachauri and Spreng, 2011](#)). Those approaches refer to the access to energy and consider three thresholds (technological, physical and economic).

The technological threshold refers to the lack of modernity in accessing energy services. The physical threshold refers to the minimum energy associated with basic necessities and the economic threshold refers to the maximum percentage of income that should be allocated to energy expenditure ([González-Eguino, 2015](#)).

As previously mentioned, energy poverty has consequences on the environment, health, and the economy.

Environmentally, the use of traditional biomass increases deforestation, land diversification and desertification (González-Eguino, 2015). Sovacool (2012) evaluates the use of traditional biomass as being responsible for 6% of global deforestation. In regard to health, the lack of energy and the use of traditional biomass (wood, coal, etc...) can be harmful due to the high level of pollution. According to the World Health Organization (WHO, 2009) pollution doubles the risk of pneumonia and other respiratory infections with women being more significantly affected ⁷. Economically, all production sectors are, indeed, affected by energy poverty. In fact, energy poverty will lead to a reduction of productivity due to the lack of reliable energy sources and clearly affect the development of the economy.

As also previously mentioned, the issue of energy poverty affects both developed and developing countries differently (Sy and Mokaddem, 2022). Energy poverty in developing countries refers to a lack of access to modern energy sources. These sources are however essential for the provision of modern energy services. It can be explained by a lack of infrastructure, a lack of well-functioning markets for energy services and a lack of sufficient income to afford modern sources of energy (Tarekegne, 2020). Knowledge production on energy poverty in developing countries is growing exponentially (Sy and Mokaddem, 2022), making it hard to understand the measurement of energy poverty. According to Sy and Mokaddem (2022), many international organisations and individual researchers have attempted to define the concept of energy poverty in developing countries. According to the International Energy Agency (IEA), energy poverty is a lack of access to electricity and dependence on the traditional use of biomass for cooking and heating (IEA, 2009). The inability of households to meet their basic energy needs (i.e cooking, heating and lighting) and have access to modern energy services is what economists call "energy poverty" (Acharya and Sadath, 2019; Byaro et al., 2024; Thomson et al., 2017). In addition, energy poverty is largely caused by lack of access to electricity and clean cooking fuels for cooking and is linked to economic underdevelopment (Bonan et al., 2017).

3.2.2 Energy poverty determinants

Given its many impacts, the determinants of energy poverty alleviation in developing countries have starting to receive attention from economists. Different factors explaining energy poverty have been analyzed, which highlight income inequality, education, institutional quality, remittances, natural resources, financial consequences, and more.

From an income inequality perspective, Dong and Hao (2018) studied the relationship between urban-rural income gap and per capita electricity for the period 1996 - 2003 using a generalized method of moments (GMM) regression. Nguyen and Nasir (2021) investigated

⁷Women are three times more likely to suffer obstructive pulmonary diseases such as chronic bronchitis and emphysema, and twice as likely to suffer lung cancer, González-Eguino (2015)

the nexus between energy and income inequality using a sample of 51 economies for the period 2002 to 2014. They found that an increase in income inequality is associated with a higher level of energy poverty. Using the same perspective, [Acheampong et al. \(2022\)](#) examined the effects of income inequality and governance on the access to electricity using a panel of 43 Sub-Saharan African countries from 1990 to 2017. They found that inequality reduces access to electricity. Furthermore, governance has also been found to be ineffective in improving it. [Gafa and Egbendewe \(2021\)](#) studied the determinants of energy poverty in rural West Africa using data for Senegal and Togo. Household incomes and types of fuel used were found to be main drivers.

Education has been found to reduce energy poverty in developing countries. The case of [Apergis et al. \(2022\)](#) evaluated the impact of education on energy poverty for 30 developing countries from 2001 to 2016 using a GMM estimator and they found a negative impact in this regard.

Concerning the impact of natural resources, findings diverge. On the one hand, [Nkoa et al. \(2023\)](#) analyzed the effect of natural resources on energy poverty for 45 Sub-Saharan African countries from 1997 to 2018 and determined that countries dependent on natural resources were found to be associated with greater energy poverty. Resources (oil, gas, mineral rents) accentuate energy poverty. On the other hand, [Bai and Liu \(2023\)](#) examined how natural resources and renewable energy consumption affected energy poverty from 1990 to 2019 for six developing countries. They found that natural resources reduced the energy poverty gap.

Remittances have been found to have an impact on energy poverty leading to its alleviation in developing countries. [Djeunankan et al. \(2023\)](#) investigated the effects of remittances on energy poverty in developing countries using ordinary least squares (OLS) and dynamic ordinary least squares (DOLS) regression. They determined that remittances reduce energy poverty in developing countries. They further found that income inequality, economic growth and education are some channels through which remittances may reduce energy poverty. [Agradi \(2023\)](#) analyzed the effects of remittances on energy poverty using a panel dataset of 51 African countries from 1991 to 2017 and found that remittances promote energy access and energy consumption.

Institutional quality also plays a large role in explaining the levels of energy poverty in countries. [Ahlborg et al. \(2015\)](#) analyzed the impact of a democratic status and institutional quality on energy poverty measured by the level of per capita household electricity consumption. Using a sample of 44 African countries from 1996 to 2009, they found positive effects resulting from these factors.

In the same way as institutional quality, a good government spending system can be a

solution to alleviate energy poverty. [Nguyen and Su \(2022\)](#) analyzed the effects of government spending for 56 developing countries and determined that an increase of government spending may alleviate energy poverty up to a certain level.

The impact of violent conflicts on energy poverty has also been analyzed. [Shettima et al. \(2023\)](#) empirically investigated this for 48 countries in Sub-Saharan Africa from 1990 to 2019 and found conflicts have a detrimental effect on electricity consumption, production, and access.

[Dong et al. \(2022\)](#) explored the impact of energy efficiency on income inequality and energy poverty for 30 Chinese provinces for the period 2004 to 2017 using a GMM-sys regression. They found that improved efficiency can simultaneously alleviate energy poverty and income inequality. More recently, [Murshed and Ozturk \(2023\)](#) assessed how energy efficiency can influence electricity accessibility in Africa. Using a dataset of 32 African countries from 2005 to 2016, they found that energy efficiency improvement, renewable energy transition, and financial development help in reducing energy poverty by declining the electricity inaccessibility rates. Concerning renewable energy consumption, [Zhao et al. \(2022\)](#) analyzed the effects of renewable energy from 2000 - 2014 for 64 countries and determined that rapid development of renewable energy can help alleviate energy poverty.

Financial inclusion and internet development determinants are also studied. [Said and Acheampong \(2023\)](#) studied the relationship between financial inclusion and energy poverty reduction for 23 Sub-Saharan African countries from 2004 - 2019. Financial inclusion was found to reduce energy poverty in SSA. [Zou et al. \(2023\)](#) explored the impact of informatization on energy poverty. Using data for 93 countries from 2000 to 2019 they found that energy poverty is generally alleviated but polarization still exists. They also found a U-shaped non-linear relationship between informatization and energy poverty. [Zhang et al. \(2023\)](#) investigated whether the development of internet services could alleviate energy poverty in China and determined that it could have a positive effect. [Wang et al. \(2023\)](#) empirically analyzed the impact of the digital economy on energy poverty using a panel dataset of 61 countries. They found that the global energy poverty index decreased as the global digital economy index increased. There is a negative relationship between digital economy and energy poverty.

3.2.3 Energy poverty and trade

Several countries have successfully implemented trade liberalization policies that have significantly impacted energy poverty reduction. We can mention the case of Kenya's Off-Grid Energy Revolution⁸. The Kenyan government has implemented several policies such as tax breaks, waiving Import duties and VAT on solar photovoltaic products, making clean energy

⁸Kenya's Off-Grid Energy Revolution: Impact and Initiatives

technologies more affordable for Kenyans and making substantial strides in rural electrification access. Kenya's off-grid connections have then increased by 5% between 2019 and 2021, resulting in 23 million people with rural electricity access in 2021. We can also mention the case of South Africa's Renewable Energy Independent Power Producer Procurement Program (REIPPPP)⁹ that resulted in significant reductions in tariff rates for solar photovoltaics (PV) and wind over a short period, and private-sector investment resulting in 5,243 MW of renewable energy. However, despite this growing literature on the determinants of energy poverty in developing countries, trade liberalization has been less explored. (Pan et al., 2019) evaluated the impact of industrialization and trade openness on energy intensity in Bangladesh with diverging results. Sadorsky (2011) examined the impact of trade on energy consumption for 8 Middle Eastern countries and found that an increase in per capita exports is associated with an increase in per capita energy consumption for the period 1980 to 2007. The same author came to the same conclusions when analysing the relationship between energy consumption and trade for 7 South American countries (Sadorsky, 2012). In China, Yan et al. (2023) explored the impact of economic complexity and financial globalization on energy poverty considering trade. They found that economic complexity and financial globalization can increase energy poverty if not assisted by appropriate trade policies.

However, these studies do not take into account the energy poverty indicators for developing countries mentioned above, or they simply do not look at the Sub-Saharan African region. Our objective is to provide such empirical evidence.

3.3 Trends in energy poverty

3.3.1 Access to electricity

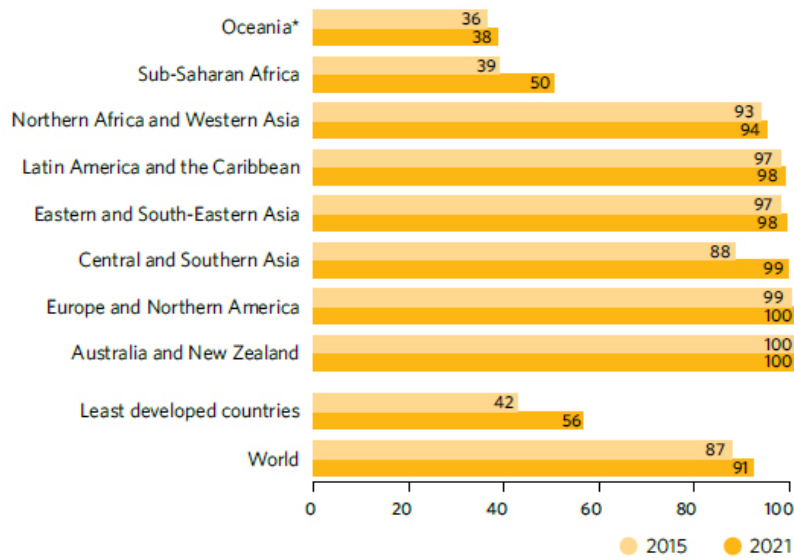
As indicated in Figure 3.2, the global electricity access rate increased from 87% in 2015 to 91% in 2021. This growth represents almost 800 million additional people gaining access to electricity. Despite this growth, we note that 675 million people, primarily located in developing countries, still lacked access to electricity in 2021. Indeed, SSA remains the primary region where people have less access to electricity. Despite significant progress (50% in 2021 compared to 39% in 2015), 567 million people did not have access to electricity in 2021 in this region.

Figure 3.3 emphasizes the fact that SSA still lags behind the world average in term of people without access to electricity. In fact, while the world average has clearly decreased since 2000, the number of people without access to electricity in SSA is increasing. Then, while Figure 3.2 shows a reduction in the percentage of people without access to electricity grid, Figure 3.3 shows

⁹South Africa's Renewable Energy Independent Power Producer Procurement Programme

an increase in the number of people without access to electricity grid. This discrepancy can be explained by the fact that despite steady progress, the annual access growth rate was of 0.6 percentage point between 2019 and 2021 which is less than the 0.8 percentage point observed between 2015 and 2019 ¹⁰.

Figure 3.2: Proportion of population with access to electricity, 2015 and 2021 (percentage)

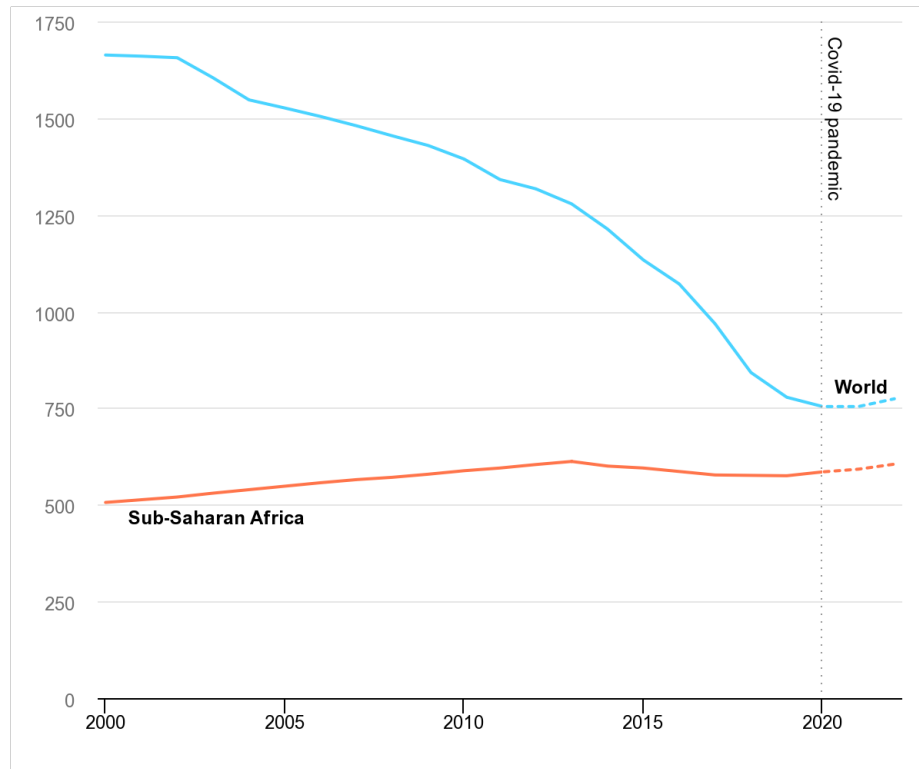


Source: The Sustainable

Development Goals Report 2023 *Excluding Australia and New Zealand

¹⁰The Sustainable Development Goals Report 2023: Special Edition

Figure 3.3: Number of people without access to electricity in Sub-Saharan Africa and the world, 2012-2022

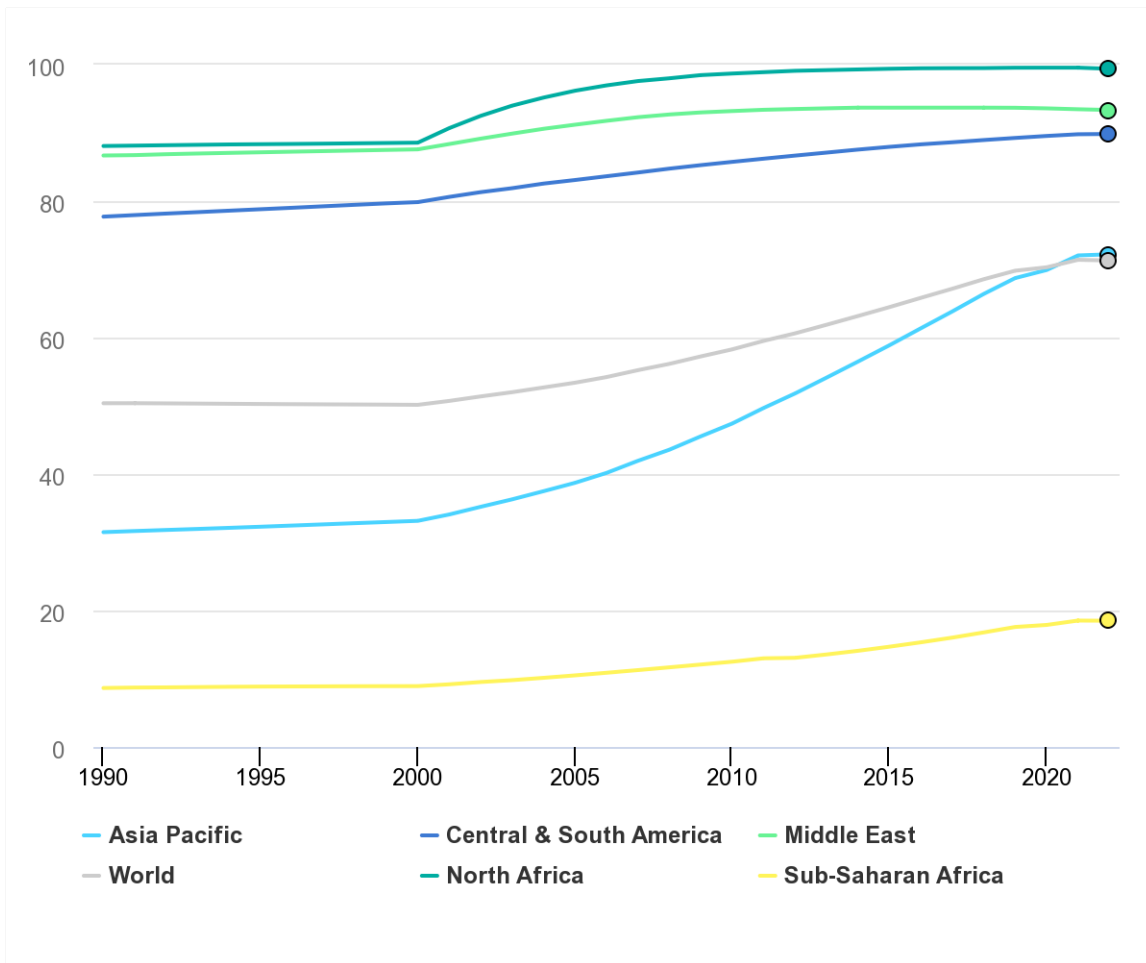


Source: The Sustainable Development Goals Report 2023

3.3.2 Access to clean fuels and technologies for cooking

Concerning access to clean cooking, we note slight progress in every region of the world (Figure 3.4); however, the global trend is still low. In fact, in 2022, 2.3 billion people lacked access to clean cooking facilities. The use of traditional biomass is still predominant. As indicated in Figure 3.4, SSA has less access to clean cooking technologies and fuels. In 2022, the share of population with access to clean cooking was estimated at 18.5%, which remains very low.

Figure 3.4: Share of population with access to clean cooking



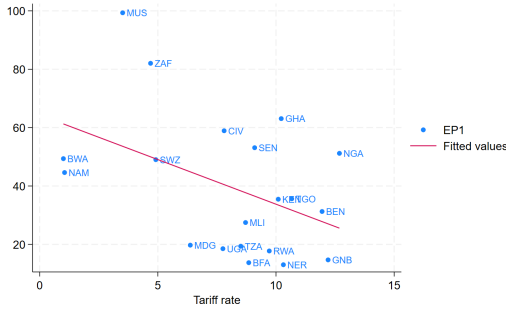
Source: IEA and the World Health Organization (WHO) Household Energy Database

3.3.3 Relationship between tariffs and energy poverty

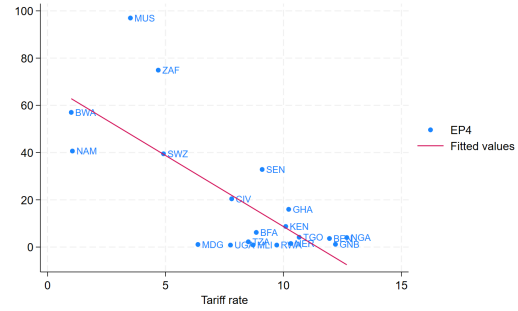
The two scatter plots presented in Figure 3.5 provide information on the relationship between tariff rates, as a proxy for trade liberalization, and indicators of energy poverty. Specifically, Figure 1 examines the association between tariff rates and access to electricity (EP1), while Figure 2 explores the relationship between tariff rates and access to clean fuels (EP2). Figure 1 shows a negative relationship between tariff rates and access to electricity in sub-Saharan Africa. As tariff rates increase, access to electricity appears to decrease, suggesting that higher trade barriers may be associated with lower levels of electrification. This trend suggests that more protectionist trade policies may discourage investment in infrastructure and energy development, potentially exacerbating energy poverty.

Figure 2 shows a negative correlation between tariff levels and access to clean fuels. Countries with higher tariffs tend to have lower access to clean fuels, reflecting a potential barrier to the adoption of modern energy solutions. This pattern suggests that higher tariffs could restrict

imports of cleaner energy technologies and products. Empirical analysis will be further be conducted in the study to discuss causality.



(a) Figure 1: Tariff rates and EP1



(b) Figure 2: Tariff rates and EP2

Figure 3.5: Tariff rates and Energy Poverty Indicators

3.4 Data description and methodology

3.4.1 Data

Our study compiles data from 20 Sub-Saharan African countries over the period 2000 - 2020 with data from the World Bank World Development Indicators (WDI) and the World Integrated Trade Solutions (WITS). The period and the sample size were chosen according to data availability. We only consider 20 countries (presented in appendix) in our analysis because our measure of trade liberalization (tariff rates) were not available for a long period for several Sub-Saharan African countries.

3.4.1.1 Measurement of energy poverty

According to [González-Eguino \(2015\)](#), energy poverty refers to a level of energy consumption that is insufficient to meet certain basic needs. It is a multifaceted concept. According to the literature ([González-Eguino, 2015](#); [Nguyen and Nasir, 2021](#); [Nguyen and Su, 2021](#); [Pachauri et al., 2004](#); [Pachauri and Spreng, 2011](#)), energy poverty can be measured using three approaches: the physical threshold, the economic threshold and the technology threshold. The physical threshold refers to the minimum energy consumption for "basic needs". The economic threshold refers to the maximum percentage of income needed for a reasonable level of energy consumption and technology threshold measures energy poverty based on the lack of access to modern energy services ([Nguyen and Nasir, 2021](#); [Nguyen and Su, 2021](#)). In the empirical literature, several measures of energy poverty are used depending on the approach and the data availability (Access to electricity, access to clean fuels, electricity consumption levels, electricity production, energy imports). However, the physical and economic approaches are limited by the choice of

minimum energy consumption (physical approach) or minimum income expenditure on energy consumption (economic approach) (González-Eguino, 2015). In our analysis, we focus on the technology approach as in Nguyen and Su (2021) and we use a proxy for a comprehensive picture of energy poverty: the access to clean fuels and modern technologies for cooking (EP). It represents the proportion of total population primarily using clean cooking fuels and technologies for cooking. This indicator focuses on the accessibility of modern, non-polluting energy sources, which is essential for alleviating energy poverty at a basic, household level. The access to clean fuels and modern technologies for cooking reflects one of the most important aspects of energy poverty which is the access to modern energy services (Nguyen and Su, 2021). This measure has been widely used in the literature (Amin et al., 2020; Nguyen and Su, 2021; Ogwumike and Ozughalu, 2016; Ozughalu and Ogwumike, 2019) and is consistent with the definition of energy poverty (González-Eguino, 2015). An increase in the access to clean fuels and modern technologies for cooking implies a decrease in energy poverty. Access to clean fuels as a measure of energy poverty is relevant for several reasons. Firstly, it is relevant to health and quality of life. In fact, access to clean fuels has a direct impact on health by reducing indoor air pollution, which is a major problem in many developing regions. Traditional cooking fuels (such as wood and coal) contribute significantly to respiratory health problems, so access to cleaner alternatives is consistent with the goal of improving basic living conditions. Secondly, it aligns with modern energy services. Modern cooking fuels are a critical component of energy poverty, as they reflect progress in household energy infrastructure and are widely recognized as a standard measure of energy access (González-Eguino, 2015; Nguyen and Su, 2021).

3.4.1.2 Measurement of the variable of interest

Our objective is to analyze the impact of trade liberalization on energy poverty alleviation. Trade liberalization refers to the reduction of trade barriers, including both tariff and non-tariff measures, to facilitate the free flow of goods and services between countries. In our analysis, We have used weighted mean tariff rates applied on all products as a measure of trade liberalization. Lower tariff rates are associated with greater trade liberalization. Several trade liberalization indicators exist, including trade cost indicators such as tariffs and non-tariff measures. Indicators can also be based on trade flows, such as trade-to-GDP measures and gravity analysis. This approach is consistent with the commonly accepted definition of trade liberalization, as tariff reductions directly affect import costs, making foreign goods more competitive in domestic markets. Tariff rates serve as a simple, policy-driven indicator of trade openness, particularly in regions such as Sub-Saharan Africa, where tariff policies have a significant impact on trade flows and economic development. The ongoing implementation of the African Continental Free Trade

Area (AfCFTA) highlights the role of tariff reductions in regional economic integration, making tariffs a particularly relevant metric. Also, by reducing tariff rates, trade liberalization can make it more affordable to import energy technologies, products and services. This reduction supports the fight against energy poverty by providing access to a wider range of energy-related goods, including clean fuels and efficient technologies.

Based on the recent empirical analysis on energy poverty, we also used the following control variables to limit the bias that may arise from omitted variables.

(i) **GDP/capita.** The level of income, measured by the GDP per capita, is expected to alleviate energy poverty, as higher income will increase the ability of households to connect to the electricity network and thus reduce energy poverty (Zhang et al., 2019b).

(ii) **Natural resources.** Natural resources represent the total natural resource rents represented by the sum of oil rents, natural gas rents, coal rents, mineral rents, and forest rents. Resource rents are expected to be an additional source of revenue and improve access to clean fuels and technologies for cooking; however, some studies have shown the opposite. Nkoa et al. (2023) have in fact, found that natural-resource dependent countries are associated with greater energy poverty. They found that resources accentuate energy poverty. Natural resources can then have positive or adverse effects on energy poverty alleviation.

(iii) **Renewable energy consumption.** In recent years, more countries have started to promote renewable energy consumption to address climate change and low-carbon energy. An increase in renewable energy consumption can help alleviate energy poverty (Zhao et al., 2022). Renewable energy consumption as a percentage of the total final energy consumption is used.

(iv) **Energy intensity.** Energy intensity refers to the amount of energy per unit of output. It measures the technical progress, and an increase in energy intensity is associated with a decrease in energy efficiency (Nguyen and Su, 2021). We follow Nguyen and Su (2021) and Djeunankan et al. (2023) by using the energy intensity level of primary energy (MJ/\$2017 PPP GDP) as a measure of energy intensity.

(v) **Urbanization.** Rapid urbanization can lead to increased energy consumption, especially in developing countries where urbanization is often associated with the growth of energy-intensive industries and transportation. Rapid urbanization levels can also effectively concentrate populations and then increase natural gas and electricity consumption, thus affecting energy poverty (Cai et al., 2021). Urbanization rate is measured as the percentage of urban population in total population.

(vi) **CO2 emissions.** Carbon emissions (co2) is also a driver of energy poverty (Apergis et al., 2022). According to Ouedraogo (2017) and Kanti (2017), poor households use unclean ("dirty") cooking fuels to survive, and that burning such fuels results in high emissions of

hazardous indoor air pollutants such as carbon monoxide, nitrogen oxides and particulate matter, which severely affect the health of household members. There is also evidence that many households in emerging markets rely heavily on inefficient fuels (e.g. kerosene) for lighting. Indoor burning without proper ventilation poses significant health risks, while certain by-products also contribute to climate-changing carbon emissions (Venkateswaran et al., 2018). Following Apergis et al. (2022), we use co2 in metric tons per capita as a measure of carbon emissions.

Table 3.1 presents the descriptive statistics. The definition and the source of each variable are presented in appendix.

Table 3.1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Access to clean fuels and technologies for cooking (%)	420	20.67	27.65	0.10	98.90
Access to electricity (%)	418	39.98	25.44	1.27	100
Tariff rate (%)	381	7.90	3.98	0.33	21.47
GDP per capita (Constant 2015 US\$)	420	2067.09	2171.59	337.63	10956.95
Renewable energy consumption (% of total energy consumption)	420	64.64	25.81	7.72	95.35
Natural resources (% of GDP)	420	6.43	4.65	0.002	24.93
Urbanization rate (% of total population)	420	36.70	13.70	14.78	70.87
Energy intensity (MJ/\$2017 PPP GDP)	420	6.11	2.61	2.13	13.88
CO2 emissions (metric tons per capita)	420	0.95	1.71	0.05	8.44
Bound rate	382	52.45	33.79	10.96	121.32

3.4.2 Data description

The descriptive statistics in Table 3.1 show that the access to clean fuels and modern energies ranging from a minimum of just 0.10% to 98.9%, indicating significant heterogeneity between the countries in the sample. The average access rate of 20.67% is significantly lower than the global average (71%)¹¹ highlighting substantial energy poverty in the region. The descriptive statistics for the access to electricity provide critical insights into the disparities and challenges in electricity access across Sub-Saharan African countries. The average access to electricity across the studied countries is approximately 40%, which indicates significant energy poverty in the region. This is notably lower than the global average (91.4%, World Bank, 2022), reflecting the challenges Sub-Saharan Africa faces in providing universal electricity access. The average tariff rate applied on all products (7.90%) is higher than the global average (2.7%, World Bank, 2017), suggesting more protectionist trade policies that could impact trade liberalization efforts.

¹¹Tracking SDG 7: The Energy Progress Report 2023

Moreover, the high variability in tariff rates (standard deviation = 3.98) across the sample may be due to several factors such as regional trade agreements, different national economic strategies, protectionism/liberalisation policies. The average GDP per capita is considerably lower (\$2067.09) than the global average (\$11314.80, World Bank, 2022), reflecting the region's economic challenges and lower income levels. Huge disparities exist among the countries in the sampling regarding renewable energy consumption. The minimum renewable energy consumption is 7.72% of total energy consumption and the maximum is 95.35% with a standard deviation of 25.81. The region's average contribution of natural resources to GDP (6.43%) indicates a significant reliance on natural resources. Sub-Saharan Africa remains less urbanized (36.70%) compared to the global average (57%, World Bank, 2022), indicating a larger rural population that might face greater energy access challenges. The region's energy intensity is higher (6.11%) than the global average (5%, World Bank, 2020), suggesting that more energy is required to produce one unit of economic output, which may indicate less efficient energy use. Average per capita CO2 emissions in the countries studied are relatively low (0.95 metric tons per capita) compared to global averages (4.3 metric tons per capita, World Bank, 2020). This reflects the generally lower levels of industrial activity and energy consumption in many Sub-Saharan African countries. The descriptive statistics reveal significant disparities between Sub-Saharan African countries and global averages in key economic and energy indicators. These disparities underscore the region's unique energy poverty and economic development challenges.

3.4.3 Methodology

Our objective is to analyze the impact of tariff rates on energy poverty measured by the access to clean fuels and modern technologies for cooking (EP). The model is described as follows :

$$EP_{i,t} = \alpha + \beta_1 Tariff_{i,t} + \beta_2 X_{i,t} + \epsilon_{i,t} \quad (3.1)$$

where EP is the access to clean fuels and modern technologies for cooking; Tariff denotes the natural logarithm of tariff rates; X is a vector of control variables including the natural logarithm of GDP per capita, the urbanization rate, the natural logarithm of renewable energy consumption, the energy intensity and the total natural resources rents; and $\epsilon_{i,t}$ denotes the error term. We also use the natural logarithm of our dependent variable (access to clean fuels) in our regressions to avoid potential heteroscedasticity and fluctuations as in [Said and Acheampong \(2023\)](#); [Wang et al. \(2023\)](#).

In the literature, empirical studies have found that improving access to clean fuels and modern technologies for cooking takes time and the interaction with other socio-economic variables may not be valid in the short term ([Acheampong et al., 2022](#); [Djeunankan et al.,](#)

2023; Said and Acheampong, 2023; Zhang et al., 2019b). It is then important to analyze the impact of tariff rates on the access to clean fuels and modern technologies for cooking using econometric techniques that captures long-term relationships (Acheampong et al., 2022; Zhang et al., 2019b).

Previous studies have used various methods to analyze the determinants of energy poverty, including generalized method of moments (GMM), ordinary least squares (OLS), fixed effects estimation (FE) and instrumental variables (2SLS). However, these methods either fail to account for endogeneity, leading to biased estimates, or omit the long-run relationship. Our study contributes to the literature and fills these gaps by using econometric techniques that take into account the long-term relationship and endogeneity.

Following studies such as Djeunankan et al. (2023) and Acheampong et al. (2022), we use different econometric techniques to analyze the long-term relationship. In our analysis, this includes the dynamic ordinary least squares (DOLS) technique, the fully modified ordinary least squares (FMOLS) technique developed by Pedroni (1996), and the canonical correlation regression (CCR) developed by Kao and Chiang (2001). These methods seek to estimate the long-term relationship among the variables.

The DOLS addresses autocorrelation and is relevant for small data series. It also has several advantages in estimating co-integrated vectors (Said and Acheampong, 2023). It solves the endogeneity problem and eliminates serial correlation present in standard ordinary least squares (OLS), where the OLS estimation is inconsistent with the cointegration panel series data (Dreger and Reimers, 2005). The FMOLS computes the long-run coefficients, and addresses serial correlation and endogeneity (Jiang et al., 2021; Said and Acheampong, 2023). FMOLS also allows for possible associations among error terms, constant terms, and the differences among regressors (Christiansen et al., 2015). The CCR in addition uses a stationary conversion method to overcome a long-run interaction between stochastic regressor errors and the co-integration equation (Christiansen et al., 2015). According to Montalvo (1995), the CCR technique exhibits less bias than the DOLS and the FMOLS.

In addition, in order to ensure the reliability of our findings, we use an alternative econometric method as robustness check to deal with the potential problem of endogeneity resulting from reverse causality that can occur. In fact, countries with higher access to clean fuels and technologies may adopt lower tariff rates to promote further adoption and enhance energy access. To address this, we use an instrumental variable method (IV-2SLS). This estimation technique is well suited to analyze structural equations that suffer from the problem of endogeneity, resulting from reverse causality between the dependent and the independent variables, and/or from omitted variable bias, and/or from measurement errors (Murshed, 2020). We use a measure

of tariff binding rate as an instrument and the first stage of the IV-2SLS is investigated to check the relevance of our instrument as well as testing for the endogeneity and the validity of our instrument.

3.5 Results and discussion

3.5.1 Preliminary analysis

The first step of our empirical analysis is to verify the presence of cross-sectional dependence between our variables. To do so, the cross-sectional dependence test by [Pesaran \(2004\)](#) was employed. The results are reported in Table 3.9 in appendix. It is based on a simple average of all pair-wise correlation coefficients of the OLS residuals obtained from standard augmented Dickey-Fuller regressions for each variable in the panel ([Apergis et al., 2022](#)). The null hypothesis of this test is that there is no evidence of cross-sectional dependency among variables. We reject the null hypothesis since our results reveal the presence of cross-sectional dependency in all of the variables.

Considering the cross-sectional dependence findings, we continue by examining the degree of integration of the variables by employing a panel unit root test, employing the [Pesaran \(2007\)](#) unit root test. We test the null hypothesis of the presence of a unit root (the variables are not stationary) against the alternative hypothesis of no unit root (the variables are stationary). The finding from the test shows that some variables do not contain a unit root at the level. However when we take their first difference, the variables become stationary. The results of this test are reported in Table 3.10 in appendix.

Furthermore, we check for the long-run relationship between the variables following ([Adebayo et al., 2022](#); [Djeunankan et al., 2023](#)). For this, we used three panel co-integration tests: the Kao co-integration panel test ([Kao, 1999](#)), the Pedroni co-integration test ([Pedroni, 2004](#)) and the Westerlund co-integration panel test ([Westerlund, 2005](#)). The co-integration between the variables of the equation was then tested. The results of each test show that the null hypotheses of no cointegration can be rejected, confirming the presence of co-integration between the variables. We then concluded that in the long-run, there is a relationship between the access to clean fuels technologies and the explanatory variables. The results are reported in Table 3.11 in appendix.

3.5.2 Empirical results

The empirical results are reported in Table 3.2. In the table, results for the DOLS, the FMOLS and the CCR are displayed.

The results show that tariff rates have a negative and significant effect at the 1% level across all models on the access to clean fuels and modern technologies for cooking for each of our estimators. Assuming all else being equal, a 1% decrease in tariff rates is associated with a 2.1% to 2.3% (depending on the estimators considered) increase in access to clean fuels and technologies for cooking. This result suggests that a reduction in tariff rates is associated with an increase of the population with access to clean fuels and modern technologies for cooking. Tariff rates reduction then contribute to energy poverty alleviation in SSA. This concurs with our expectations and verifies the hypothesis 1. This finding is in line with the Heckscher-Ohlin theory. Reduction in tariff rates will increase the availability of energy for households and industries. Furthermore, it will increase access to affordable energy sources by lowering the cost of imported clean cooking fuels and technologies and make them more affordable for households, especially for those with lower incomes. We conclude that tariff rates reduction reduce energy poverty by increasing the access to clean fuels and modern technologies for cooking. Policies aimed at reducing tariffs on key clean energy products, such as those promoted by the AfCFTA, could be an effective way to increase access to clean fuels in SSA. Tariff reductions can help reduce costs, thereby encouraging the adoption of cleaner energy solutions by reducing the financial burden on households. Regarding the control variables, we found that the coefficient associated with income (GDP per capita) was positive and significant at the 1% level in each of our estimators. This suggests that income increases access to clean fuels and modern technologies for cooking and alleviates energy poverty by making it more affordable. Higher income levels enable households to afford the upfront costs associated with purchasing clean cooking fuels and technologies, as well as the ongoing expenses related to fuel refills or maintenance, even though clean fuels and modern technologies may have higher upfront costs than traditional biomass fuels and rudimentary cooking methods. As incomes increase, households are more able to afford these investments, making clean cooking options more accessible. As incomes rise, households will also prioritize convenience, time saving methods and health in their consumption choices. This finding agrees with previous studies ([Acheampong et al., 2022](#); [Apergis et al., 2022](#)).

The results indicate that the use of renewable energy has a positive and significant impact at the 1% level across all models on access to clean cooking fuels and technologies. This highlights the critical role of renewable energy in improving energy access in Sub-Saharan Africa. For example, renewable energy technologies such as solar and wind have low operating costs once installed. This reduces the overall cost of energy production compared to fossil fuels. This can translate into more affordable energy for consumers, making clean fuels and technologies more accessible. The positive impact of renewable energy in alleviating energy poverty is in line with [Zhao et al. \(2022\)](#). This finding suggests that policies to promote renewable energy development, such as

subsidies or incentives for solar and wind energy projects, could be effective in addressing energy poverty.

The coefficient associated with natural resources has been found to be negative and significant at the 1% level in the FMOLS estimator, suggesting that natural resources have a negative impact on the access to clean fuels as in [Nkoa et al. \(2023\)](#). This finding suggests that resource-rich African countries are not using the resources they have efficiently ([Nkoa et al., 2023](#)). For example, natural resource wealth can lead to governance issues, including corruption and misallocation of funds. This can have a negative impact on investment in clean energy infrastructure.

The coefficient associated with urbanization is positive and significant at the 1% level in all estimators suggesting that an increase in urbanization is associated with an increase in access to clean fuels and technologies for cooking. Rapid urbanization can then contribute to alleviate energy poverty, which is in line with [Qi et al. \(2024\)](#). For example, the proximity of markets and suppliers in urban areas makes it easier for households to buy and maintain clean cooking technologies.

Energy intensity's coefficient is significant and negative in the DOLS and CCR estimations. Energy intensity refers to the amount of energy per unit of output. An increase in energy intensity is therefore associated with a decrease in energy efficiency. Thus, this finding suggests that a decrease in energy efficiency is associated with a decrease of the population with access to clean fuels and modern technologies for cooking. This can be explained by the fact that an increase in energy intensity often leads to higher energy costs for households. This can result from the use of less efficient cooking technologies or reliance on energy sources with higher costs per unit of energy. A decrease in energy efficiency is then associated with an increase of energy poverty which is line with [Djeunankan et al. \(2023\)](#).

The results indicate a significant negative relationship between CO₂ emissions and access to clean fuels and modern cooking technologies at the 1% level in all the estimators suggesting that an increase in CO₂ emissions is associated with a decrease in access to clean fuels and technologies for cooking which is in line with [Apergis et al. \(2022\)](#). The higher carbon emissions clearly show that households have less access to clean energy and mostly use dirty forms of heating that produce high levels of carbon emissions ([Apergis et al., 2022](#)).

Table 3.2: Tariff rates and access to clean fuels and modern technologies for cooking

VARIABLES	Dependable variable: Access to clean fuels		
	[DOLS]	[FMOLS]	[CCR]
Tariff rates	-0.021*** (0.004)	-0.023*** (0.003)	-0.021*** (0.002)
GDP per capita (log)	2.093*** (0.133)	1.940*** (0.082)	2.076*** (0.076)
Renewable energy consumption (log)	0.391*** (0.140)	0.446*** (0.087)	0.484*** (0.080)
Natural Resources	-0.001 (0.004)	-0.007*** (0.002)	-0.002 (0.002)
Urbanization	0.030*** (0.003)	0.041*** (0.002)	0.029*** (0.002)
Energy intensity	-0.030** (0.017)	-0.011 (0.010)	-0.040*** (0.009)
CO2 emissions	-0.379*** (0.064)	-0.374*** (0.040)	-0.362*** (0.038)
Constant	-15.537*** (1.235)	-15.161*** (0.766)	-15.620*** (0.728)
Number of observations	381	380	380
R-squared	0.95	0.75	0.86

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.6 Robustness check

3.6.1 Discussion of endogeneity

As said previously, to ensure the robustness of our results, we use an instrumental variable method to deal with the potential endogeneity. We use a measure of tariff binding rate as an instrument. It is the unweighted average of all the lines in the tariff schedule in which bound rates have been set. This instrument is relevant and is strongly correlated with our endogenous

explanatory variable, tariff rates. In fact, actual tariff levels cannot exceed bound tariff levels, which directly constrain the policy space for tariffs. Also, our instrument is also exogenous. In fact, tariff bindings are typically determined during WTO negotiations based on historical trade patterns and negotiation processes and are thus relatively exogenous to current energy consumption decisions. Table 3.3 provides the estimated results of the instrumental variable method. The results of the first-stage regression are presented in Table 3.12 in appendix. An endogeneity test is performed and confirms that tariff rate is endogenous, hence the use of an instrumental variable estimator. The validity of our proposed instrument (Bound rate) is assessed via the Kleibergen-Paap rk LM statistic test for under-identification and Cragg-Donald Wald F test for weak identification. The baseline results are robustly supported by the new findings. In fact, the coefficient on tariff rates is negative and highly significant at the 1% level, suggesting that a reduction in tariff rates is associated with an increase in access to clean fuels and modern cooking technologies. This additional finding high lights the significant role of tariff reductions in increasing energy accessibility, likely due to the reduced cost of importing clean energy products. Regarding the control variables, we found significant evidence at the 1% level for GDP per capita, urbanization rate and energy in tensity. As in the baseline results, increases in GDP and the urbanization rate allow greater access to clean energy solutions. Similarly, increases in energy intensity limit the adoption of clean technologies. We found no statistical evidence for the other control variables.

Table 3.3: Regression results of instrumental variable method

VARIABLES	Dependent variable :Access to clean fuels
Tariff rates	-0.229*** (0.048)
GDP per capita (log)	0.630*** (0.152)
Renewable energy consumption (log)	-0.333 (0.251)
Natural Resources	-0.005 (0.016)
Urbanization	0.025*** (0.005)
Energy intensity	-0.088*** (0.025)
CO2 emissions	-0.093 (0.066)
Constant	-0.179 (1.691)
Number of observations	381
Endogeneity test	0.0000
Cragg-Donald Wald F statistic	45.816
Kleibergen-Paap rk LM statistic (p value)	0.0000
Robust standard errors in parentheses	

*** p<0.01, ** p<0.05, * p<0.1

3.6.2 Panel-Corrected Standard Error

Due to the presence of cross-correlation, we also use a panel-corrected standard error (PCSE) technique as a robustness check (Table 3.4). This technique provides an estimate that is free from autocorrelation and accurate standard error estimate (Ikpesu et al., 2019). The coefficient of tariff rates is negative and statistically significant at the 5% level. This finding is consistent with previous findings and reinforces the idea that lower tariffs reduce the cost of importing clean energy technologies, making them more affordable. Regarding the control variables, we found significant evidence at the 1% level for GDP per capita, urbanization rate and co2 emissions. As in the baseline results, increases in GDP and the urbanization rate allow greater access to clean energy solutions. Similarly, increases in co2 emissions limit the adoption of clean technologies.

We also found significant evidence at the 10% level for renewable energy consumption suggesting that renewable energy can help improve energy access. We found no statistical evidence for the other control variables.

Table 3.4: Tariff rates and access to clean fuels and modern technologies for cooking (Panel corrected standard error results)

VARIABLES	Dependent variable :Access to clean fuels
Tariff rates	-0.021** (0.009)
GDP per capita (log)	2.093*** (0.213)
Renewable energy consumption (log)	0.391* (0.231)
Natural Resources	0.001 (0.009)
Urbanization	0.030*** (0.004)
Energy intensity	-0.030 (0.027)
CO2 emissions	-0.379*** (0.027)
Constant	-15.537*** (1.975)
Observations	381
R-squared	0.96

Panel corrected standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.6.3 Additional controls

Additional controls often used in the literature are also added to the baseline specification in the Table 3.5. These additional controls are remittances, institutional quality and population growth. Remittances which refer to financial or in-kind transfers made by migrants to their friends or family members in their home communities have been found to have an impact on energy poverty. We observed that remittances have a positive and significant impact at the 1% level (FMOLS) and at the 5% level (CCR) on the access to clean fuels. This finding suggests that remittances have an impact on energy poverty leading to its alleviation and this concurs with

[Djeunankan et al. \(2023\)](#) and [Agradi \(2023\)](#). Remittances can be a valuable source of financial support for energy access. Policymakers could encourage remittance flows through favorable tax policies or financial products that help families in SSA invest in clean energy technologies, thereby helping to alleviate energy poverty.

We also use a measure of institutional quality. We use the mean of the six indicators from the World Governance Indicators database. The coefficient associated with institutional quality has a positive and significant impact at the 1% level on the access to clean fuels in all the estimations. This finding suggests that strong institutions can help alleviate energy poverty. High quality institutions are likely to create an environment conducive to energy investment and efficient policy implementation. This finding is in line with [Ahlborg et al. \(2015\)](#) Improving institutional quality can help reduce energy poverty by promoting stable, transparent governance that attracts investment in energy infrastructure. Policies that focus on improving governance, reducing corruption and strengthening regulatory frameworks can indirectly improve access to clean energy.

We also control for the population growth rate. The coefficient is negative and statistically significant at the 1% level in in all models. This suggests that higher population growth is associated with reduced access to clean cooking technologies, likely due to the strain on existing energy infrastructure. Rapid population growth in SSA underscores the need for policies that expand energy infrastructure to keep pace with demand. Policymakers could focus on scalable clean energy solutions and investment in energy access infrastructure to serve growing populations.

Table 3.5: Testing for additional controls on baseline specification

VARIABLES	Dependable variable: Access to clean fuels		
	[DOLS]	[FMOLS]	[CCR]
Tariff rates	-0.022*** (0.004)	-0.018*** (0.001)	-0.021*** (0.002)
GDP per capita (log)	1.506*** (0.145)	1.367*** (0.054)	1.511*** (0.079)
Renewable energy consumption (log)	0.596*** (0.134)	0.589*** (0.050)	0.686*** (0.071)
Natural Resources	-0.007* (0.004)	-0.006*** (0.001)	-0.008*** (0.002)
Urbanization	0.049*** (0.004)	0.052*** (0.001)	0.048*** (0.002)
Energy intensity	-0.060*** (0.016)	-0.069*** (0.006)	-0.069*** (0.008)
CO2 emissions	-0.296*** (0.057)	-0.284*** (0.021)	-0.277*** (0.032)
Remittances	0.009 (0.008)	0.021*** (0.003)	0.011** (0.004)
Institutional quality	0.600*** (0.068)	0.567*** (0.025)	0.589*** (0.035)
Population growth	-0.366*** (0.045)	-0.335*** (0.017)	-0.373*** (0.024)
Constant	-11.686*** (1.290)	-10.886*** (0.487)	-11.893*** (0.714)
Number of observations	362	361	361
R-squared	0.96	0.84	0.88

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.6.4 Alternative dependent variable: Access to electricity

We also consider an alternative measure of energy poverty: the access to electricity (Table 6). This measure has been widely used in the literature ([Apergis et al., 2022](#); [Djeunankan et al., 2023](#); [Said and Acheampong, 2023](#)) and is in line with the definition of energy poverty given by the IEA. The results show that the coefficient for tariff rates is negative and statistically significant at the 1% level across all models, indicating that a reduction tariff rates is associated with an increase in access to electricity. This finding highlights the importance of reducing tariffs on energy infrastructure equipment, such as solar panels, generators and transformers, to improve access to electricity in SSA. Regarding the control variables, we found that the coefficient associated with GDP per capita is positive and statistically significant at the 1% level across all models, suggesting that an increase in GDP per capita is associated with an increase in access to electricity. This suggests that economic growth directly supports the ability of households to connect to the grid, highlighting income as an important factor in improving energy access. This finding agrees with previous studies ([Acheampong et al., 2022](#); [Apergis et al., 2022](#); [Nguyen and Nasir, 2021](#)).

The results indicate that the use of renewable energy has a positive and significant impact at the 1% level across all models on access to electricity. Expanding renewable energy infrastructure is a sustainable and cost-effective way to increase access to electricity.

The coefficient associated with natural resources has been found to be negative and significant at the 1% level across all the models, suggesting that natural resources have a negative impact on the access to electricity as in [Nkoa et al. \(2023\)](#). This negative relationship suggests that higher dependence on natural resources correlates with lower access to electricity.

The coefficient associated with urbanization is positive and significant at the 1% level in all estimators suggesting that an increase in urbanization is associated with an increase in access to electricity which is in line with [Qi et al. \(2024\)](#). As urbanization continues in SSA, urban planning should prioritize the development of energy infrastructure.

Energy intensity's coefficient is significant and negative at the 1% level across all the models. Thus, this finding suggests that a decrease in energy efficiency is associated with a decrease of the population with access to electricity. Improving energy efficiency can support increased electricity access by reducing energy costs.

The results indicate a significant negative relationship between CO₂ emissions and access to electricity at the 1% level in all the estimators suggesting that an increase in CO₂ emissions is associated with a decrease in access to electricity which is in line with [Apergis et al. \(2022\)](#).

Table 3.6: Tariff rates and access to electricity

VARIABLES	Dependable variable: Access to electricity		
	[DOLS]	[FMOLS]	[CCR]
Tariff rates	-0.033*** (0.007)	-0.016*** (0.0007)	-0.017*** (0.000)
GDP per capita (log)	1.138*** (0.127)	1.349*** (0.020)	1.634*** (0.0001)
Renewable energy consumption (log)	0.605*** (0.236)	0.820*** (0.021)	0.842*** (0.0001)
Natural Resources	-0.078*** (0.010)	-0.008*** (0.000)	-0.006*** (0.000)
Urbanization	0.048*** (0.003)	0.021*** (0.0005)	0.054*** (0.000)
Energy intensity	-0.030** (0.017)	-0.019*** (0.002)	-0.032*** (0.000)
CO2 emissions	-0.676*** (0.095)	-0.065*** (0.009)	-0.322*** (0.000)
Constant	-7.575*** (1.649)	-9.738*** (0.185)	-12.906*** (0.001)
Number of observations	369	379	379
R-squared	0.96	0.53	0.82

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.6.5 Sensitivity: Excluding Upper-middle income countries

To strengthen the robustness of our results, we are running a sensitivity analysis. We modify the sample by excluding upper-middle income countries (Table 3.7). In our case, we exclude South Africa which is classified as an upper-middle income country according to the World Bank classification to see if the results are consistent within lower-and middle-income countries in SSA. The results don't change and remain robust. The coefficient for tariff rates is consistently

negative across all models and statistically significant at the 1% level, strengthening the argument that trade liberalization in the form of tariff reductions facilitates access to modern energy solutions.

Table 3.7: Tariff rates and access to clean fuels and modern technologies for cooking (Excluding South Africa)

VARIABLES	Dependable variable: Access to clean fuels		
	[DOLS]	[FMOLS]	[CCR]
Tariff rates	-0.023*** (0.005)	-0.025*** (0.002)	-0.023*** (0.003)
GDP per capita (log)	2.118*** (0.151)	2.024*** (0.083)	2.113*** (0.087)
Renewable energy consumption (log)	0.224 (0.169)	0.234** (0.094)	0.329*** (0.097)
Natural Resources	-0.003 (0.005)	-0.006** (0.002)	-0.0004 (0.003)
Urbanization	0.033*** (0.005)	0.040*** (0.002)	0.031*** (0.002)
Energy intensity	-0.022 (0.020)	-0.008 (0.011)	-0.031*** (0.011)
CO2 emissions	-0.662*** (0.090)	-0.672*** (0.050)	-0.640*** (0.050)
Constant	-15.047*** (1.465)	-14.739*** (0.811)	-15.240*** (0.868)
Number of observations	360	359	359
R-squared	0.95	0.75	0.86

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.6.6 Sensitivity: Alternative estimation methods

To strengthen the robustness of our results, we also run a fixed effects (FE) and a random effects (RE) controlling for unobserved heterogeneity (Table 3.8). The results don't change and

remain robust. The coefficient for tariff rates is consistently negative across all models and statistically significant at the 5% level, confirming that a reduction in tariff rates is associated with an increase of the population with access to clean fuels and modern technologies for cooking. Concerning the control variables, the results remain robust when statistically significant.

Table 3.8: Tariff rates and access to clean fuels and modern technologies for cooking (FE and RE

VARIABLES	Dependable variable: Access to clean fuels	
	[FE]	[RE]
Tariff rates	-0.021** (0.009)	-0.022** (0.009)
GDP per capita (log)	2.093*** (0.255)	1.890*** (0.215)
Renewable energy consumption (log)	0.391 (0.269)	0.281 (0.257)
Natural Resources	0.001 (0.009)	-0.0003 (0.009)
Urbanization	0.030*** (0.007)	0.030*** (0.006)
Energy intensity	-0.030 (0.033)	-0.048 (0.031)
CO2 emissions	-0.379*** (0.124)	-0.292*** (0.109)
Constant	-15.215*** (2.466)	-13.289*** (2.172)
Number of observations	381	381
R-squared	0.68	0.72

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.7 Conclusion and Policy Implications

The aim of this study was to contribute to the growing literature on the determinants of energy poverty in developing countries. The analysis investigated the impact of tariff rates reduction on access to clean fuels and modern technologies for cooking on a panel dataset of 20 Sub-Saharan African countries over the period 2000 - 2020. We employed a DOLS, FMOLS and CCR techniques to estimate the long-run relationship among the variables. By examining tariff reductions as a proxy for trade liberalisation, and incorporating economic, environmental and demographic factors, this research contributes to a nuanced understanding of how open trade policies can affect energy access in a region where energy poverty remains a pressing challenge, filling a critical gap in the literature on energy poverty and development. The novelty of this study lies in its interdisciplinary approach, linking trade liberalization to the pressing issue of energy poverty, especially in the African context, a relatively under-explored area of research.

The empirical findings have helped to better understand the relationship between energy poverty and trade, supporting the presence of a negative and statistically significant relationship between tariff rates reduction and energy poverty. This result support trade theories such as the Heckscher-Ohlin theory indicating that a reduction in tariffs can lower the cost of clean energy technologies making them more accessible to population. Trade liberalization can then help alleviate energy poverty in the region. This finding is in line with previous studies ([Sadorsky, 2011](#); [Yan et al., 2023](#)). Positive and statistically significant relationships were also found between energy poverty reduction and other variables such as economic growth, renewable energy consumption, and urbanization rate in the study. Moreover, the study also showed a negative and statistically significant effect of energy intensity, natural resources and co2 emissions on energy poverty reduction.

This study could help policymakers and governments to mitigate energy poverty in SSA, given the inadequate policies and solutions to address energy poverty in the region. The model indicates a significant relationship between trade liberalization measured by tariff reductions and increased access to clean fuels in SSA. This suggests that the implementation of the AfCFTA and the reduction of tariff measures among African countries can help alleviate energy poverty in the region. This can be achieved by targeting, subsidizing or exempting clean energy products from taxation. Governments in SSA could implement targeted tariff reductions. However, tariff reductions and increased in trade are not sufficient to achieve the SDG7. Policies that focus on the trade structure and the accessibility of modern energies are needed. By harmonizing tariff policies and regulatory frameworks for energy products, AfCFTA member states can collectively

benefit from economies of scale and a streamlined import process for energy technologies. The positive impact of renewable energy consumption suggests that governments should invest in and promote renewable energy projects such as solar power, wind power and hydroelectric power. This can be done by further supporting low-income households and provide subsidies for key clean energy technologies. For example, subsidizing the cost of off-grid solar home systems can make clean energy accessible in remote areas where grid extension is economically challenging. We can also create favorable regulatory frameworks, provide financial incentives and encouraging public-private partnerships. Public-private partnerships could facilitate investment in renewable energy projects that provide decentralized energy solutions, such as mini-grids or community solar farms, to areas underserved by the main grid. The implementation of national energy efficiency programmes in all sectors, with a focus on the promotion of energy efficient cooking technologies can also help alleviate energy poverty in SSA. Tariff exemptions for renewable energy components such as solar panels, batteries and efficient cookstoves can also be implemented by governments. This would immediately reduce upfront costs for households and encourage a shift away from traditional, polluting fuels. However, to reduce dependence on imported clean energy technologies, countries could encourage local production of renewable technologies. By creating special economic zones or tax incentives for companies that produce solar panels or clean cookstoves locally, countries can reduce costs and boost local economies.

In addition to its contribution to the existing literature, the present study also reports some limitations that suggest some future directions. The present study focused on 20 Sub-Saharan African countries. A possible extension would be to increase the sample to all African countries given the data availability but also other developing countries and then divide the sample into two parts with African countries on the one hand and developing countries on other continents also experiencing energy poverty. This broader sample will allow for a more comprehensive understanding of how tariff rates and other factors affect access to clean fuels and modern cooking technologies in different socio-economic and cultural contexts. Splitting the sample into African countries and other developing countries allows for comparative analysis. This can reveal regional differences and similarities in the determinants of access to clean fuels. Furthermore, although this study used macroeconomic data, analysing the impact of reducing tariffs on energy poverty from a microeconomic perspective can enrich understanding on how reduced tariffs impact household spending on energy and provide important policy implications. This micro-level analysis could reveal the direct economic benefits to households and provide a clearer picture of energy affordability after liberalization. In addition, while this study focuses on tariff reductions, further research could examine the effects of other trade policies. Although

contributing to the literature, our study also rise some unresolved questions. Trade liberalization alone may not be sufficient to achieve widespread energy access, especially in SSA. Further exploration is required into how it interacts with other policies. The role of governance quality in shaping the effectiveness of trade liberalization on energy access was not a primary focus of this study. Countries with stronger institutional frameworks may implement trade policies more effectively and attract more investment in clean energy. However, how governance directly influences the outcomes of trade liberalization in the context of energy poverty remains an open question.

3.8 Appendix

Table 3.9: Cross-section dependence tests

Variable	CD test (<i>p-values</i>)
Access to clean fuels and technologies for cooking	25.04 (0.00)
Access to electricity	53.87 (0.00)
Tariff rate	6.46 (0.00)
GDP per capita	48.12 (0.00)
Renewable energy consumption	28.76 (0.00)
Natural resources	15.45 (0.00)
Urbanization rate	45.83 (0.00)
Energy intensity	15.77(0.00)
CO2 emissions	25.73 (0.00)

Table 3.10: Panel unit root tests

Variable	First difference (IPS) [H0: Contains a unit root]
Access to clean fuels and technologies for cooking	-5.452***
Access to electricity	-12.267***
Tariff rate	-9.324***
GDP per capita	-5.696***
Renewable energy consumption	-8.207***
Natural resources	-9.081***
Urbanization rate	-4.182***
Energy intensity	-9.702***
CO2 emissions	-9.419***

Notes : ***, **, * denotes significance level at 1%, 5% and 10% respectively.

Table 3.11: Panel cointegration tests

Model	Statistic		
	[Kao integration test]	[Pedroni test]	[Westerlund test]
Equation 1	-1.291*	-8.228***	-2.124**

Notes : ***, **, * denotes significance level at 1%, 5% and 10% respectively.

Table 3.12: First-stage regression results

VARIABLES	Dependent variable : Tariff rates
Trade	0.036*** (0.011)
GDP per capita (log)	-1.413*** (0.440)
Renewable energy consumption (log)	-0.099 (0.777)
Natural Resources	0.141*** (0.062)
Urbanization	0.036** (0.015)
Energy intensity	0.040 (0.072)
CO2 emissions	0.455** (0.228)
Constant	-18.719*** (4.708)
Number of observations	380
R-squared	0.44

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: Trade (% GDP) represents the instrument

Table 3.13: List of countries (20)

Benin	Mauritius
Botswana	Namibia
Burkina Faso	Niger
Cote d'Ivoire	Nigeria
Eswatini	Rwanda
Ghana	Senegal
Guinea-Bissau	South Africa
Kenya	Tanzania
Madagascar	Togo
Mali	Uganda

Table 3.14: Variables and data source

Variables	Source
Access to clean fuels and technologies for cooking	World Bank WDI
Access to electricity	World Bank WDI
Tariff rate	WITS
GDP per capita	World Bank WDI
Renewable energy consumption	World Bank WDI
Natural resources	World Bank WDI
Urbanization rate	World Bank WDI
Energy intensity (MJ/\$2017 PPP GDP)	World Bank WDI
CO2 Emissions (metric tons per capita)	World Bank WDI

General Conclusion

The SDGs represent a transformative agenda for SSA, encompassing a comprehensive vision for addressing the region's most pressing challenges while promoting inclusive, sustainable, and resilient development. As SSA moves towards achieving the SDGs, it is imperative to recognize the profound importance of these goals and the critical role they play in defining the region's future trajectory. The SDGs provide a framework for addressing the multiple dimensions of development in SSA, encompassing economic growth, social inclusion, environmental sustainability, and institutional resilience. By adopting the SDGs, Sub-Saharan African countries commit to making progress on key priorities such as poverty eradication, food security, gender equality, access to health and education, clean energy, sustainable infrastructure, and climate action. Achieving the SDGs in SSA is not just an aspiration but a moral imperative, driven by the urgent need to tackle the region's deep-rooted poverty, inequality, and vulnerability. SSA is home to some of the world's most vulnerable populations, disproportionately affected by poverty, hunger, disease, environmental degradation, and conflict. By aligning national development strategies with the SDGs, Sub-Saharan African countries can attract investment in critical sectors such as renewable energy and sustainable agriculture. In addition, achieving the SDGs can unlock new market opportunities, foster regional integration, and strengthen SSA's competitiveness in the global economy. Further trade liberalization in SSA has profound implications for the achievement of the SDGs in the region. As Sub-Saharan African countries move further along the development path, trade liberalization is emerging as a key driver of inclusive, sustainable, and resilient growth, offering a pathway to achieving the aspirations embodied in the SDGs. Trade liberalization in SSA is helping to unlock the region's economic potential and foster widespread prosperity. By reducing trade barriers and facilitating market access, trade liberalization enables Sub-Saharan African countries to harness the benefits of globalization, participate more effectively in international trade and integrate into global value chains. This helps to diversify the economy, boost productivity, create jobs and encourage investment, laying the foundations for sustained and inclusive economic growth.

The aim of this thesis was then to analyse the impact of trade liberalization on several SDGs relevant to the SSA region. The thesis analysed the impact of trade liberalization

on unemployment, food security and energy poverty and led to various results and policy recommendations. Essay 1 analysed empirically the impact of trade liberalization on unemployment. A descriptive analysis and an overview of trends in unemployment are also presented. To empirically evaluate the impact of trade liberalization on unemployment, we used the Generalized Method of Moments (GMM) to avoid potential endogeneity and because of the dynamic nature of the model. Our findings show that trade have a significant negative effect on unemployment over the period 2000-2019. By considering the gender and considering separately male unemployment and female unemployment, we found that trade still have a negative impact on both male and female unemployment with a greater impact on female unemployment. Regarding youth unemployment, we also noted a significant and negative effect of trade. In terms of policy implications, several recommendations can be made based on the empirical results. Our findings suggest that trade liberalization is a good way of creating jobs. Policymakers should then firstly continue to pursue trade liberalisation policies, including the reduction of tariffs and non-tariff barriers, to deepen SSA's integration into the global economy. Governments should implement policies that support the growth of export-oriented industries, especially those with the potential to employ large segments of the population. Secondly, given the potential of capital investment to reduce unemployment, priority should be given to policies that encourage both domestic and foreign investment in infrastructure, technology and other productive assets. This may include tax incentives, improved access to finance and streamlined regulatory procedures. Policies should focus on attracting investment in sectors such as manufacturing, agriculture and services, which have a higher potential for job creation. Thirdly, the gender analysis show that the negative impact of trade liberalization is higher for female unemployment than male unemployment. Then, gender-equity policies are necessary to promote gender-equitable employment such as improving girls' education. Finally, young people employment should be priority for Sub-Saharan African countries. Then, programs that include training programs for youth unemployed people, job search assistance, and the creation of jobs for youth unemployed people could be created.

Essay 2 analysed empirically the impact of cereal import openness on food security. We employed a two stage least square instrumental variable (2SLS-IV) estimator to deal with potential endogeneity and control for country and time fixed effects. The results showed that cereal import openness have a positive and statistically significant impact on the prevalence of undernourishment suggesting that cereal import openness increases the prevalence of undernourishment and then worsen food security. This finding is in line with the literature on trade and food security. The negative effects of cereal import openness on food security remain significant and consistent with alternative food security indicators such as dietary energy supply

adequacy as well as the average protein supply available for consumption, representing other aspects of food security. Besides that, the economic and agricultural factors have been found to affect positively food security. In fact, GDP growth, cereal yield and arable land variables have a positive impact on food security regardless of the indicator used. On the contrary, the employment in agriculture and the population growth negatively affect food security. In terms of policy implications, several recommendations can be made based on the empirical results. Our results have pointed out the adverse effect of cereal import openness on food security. A great reliance on imports then exposes countries to global market risks. Policies should aim to balance imports with increased domestic production. This could include incentives for local cereal production and reducing barriers to entry for small-scale farmers. While imports are necessary, the negative impact on food security indicates a need for careful management of trade policies. Governments should negotiate favorable trade agreements that ensure stable and affordable cereal supplies. Diversifying import sources and creating regional trade partnerships can also reduce dependency on a single market. The negative and significant relationship between cereal yield and undernourishment underlines the importance of increasing domestic agricultural productivity. Governments should invest in agricultural research and development, subsidize high-yielding and resilient crop varieties, and promote modern farming techniques. Extension services that provide training and resources to farmers can also increase productivity. Land reform policies that provide secure land tenure and access to arable land for smallholders are also essential. In addition, investment in irrigation and infrastructure can make more land suitable for farming. By enhancing domestic agricultural productivity, reducing dependency on cereal imports and promoting economic growth, governments can address undernourishment and help build more resilient and food secure countries.

Essay 3 analysed empirically the impact of trade liberalization on energy poverty. We measure trade liberalization by tariffs rate reduction and energy poverty is measured by the access to clean fuels and modern technologies for cooking. We employed a dynamic ordinary least square (DOLS), a fully modified ordinary least squares (FMOLS) and a canonical correlation regression (CCR) techniques to estimate the long-run relationship among the variables. The empirical findings have helped to better understand the relationship between energy poverty and trade, supporting the presence of a negative and statistically significant relationship between tariff rates reduction and energy poverty. This result support trade theories such as the Heckscher-Ohlin theory indicating that a reduction in tariffs can lower the cost of clean energy technologies making them more accessible to population. Positive and statistically significant relationships were also found between energy poverty reduction and other variables such as economic growth, renewable energy consumption, and urbanization rate in the study. Moreover,

the study also showed a negative and statistically significant effect of energy intensity, natural resources and co2 emissions on energy poverty reduction. This study could help policymakers and governments to mitigate energy poverty in SSA, given the inadequate policies and solutions to address energy poverty in the region. The negative impact of tariff rates reduction on the access to clean fuels and modern technologies for cooking suggests that the implementation of the AfCFTA and the reduction of tariff measures among African countries can help alleviate energy poverty in the region. This can be achieved by targeting, subsidizing or exempting clean energy products from taxation. However, tariff reductions and increased in trade are not sufficient to achieve the SDG7. Policies that focus on the trade structure and the accessibility of modern energies are needed. Investment programs targeting clean energy infrastructure and technologies are also needed. The positive impact of renewable energy consumption suggests that governments should invest in and promote renewable energy projects such as solar power, wind power and hydroelectric power. This can be done by creating favorable regulatory frameworks, providing financial incentives and encouraging public-private partnerships. The implementation of national energy efficiency programmes in all sectors, with a focus on the promotion of energy efficient cooking technologies can also help alleviate energy poverty in SSA.

The empirical analyses carried out in the 3 essays highlight the significant impact of trade liberalisation on unemployment, food security and energy poverty in SSA. Firstly, regarding unemployment, Essay 1 demonstrates that trade liberalization has a significant negative effect on unemployment rates, particularly benefiting female and youth employment. This suggests that trade liberalization can be an effective tool for job creation. The policy implications emphasize the importance of expanding trade, both through domestic and foreign investment, while implementing gender-equity policies and youth employment programs. Secondly, in terms of food security, Essay 2 reveals that cereal import openness has a negative impact on reducing undernourishment and improving food security. This finding emphasizes the adverse effect of cereal import openness on food security. A great reliance on imports then exposes countries to global market risks. Lastly, Essay 3 explores the impact of trade liberalization on energy poverty, showing that tariff reductions can help alleviate energy poverty by increasing access to clean fuels and modern cooking technologies. Policy recommendations stress the importance of initiatives such as the African Continental Free Trade Area (AfCFTA), reduction of tariffs, and investment in clean energy infrastructure and technologies.

The results also show that certain measures must accompany trade liberalization to effectively impact unemployment, food security and energy poverty. The agricultural sector has obviously emerged as an important factor of improving food security particularly in regions like SSA where a significant portion of the population depends on agriculture for their livelihoods

and food supply. Programs that focus on increasing agricultural productivity through technology adoption, improved seeds, and sustainable farming practices can enhance food production and availability. Similarly, investments in infrastructure such as roads, storage facilities, and irrigation systems can improve market access, reduce post-harvest losses, and ensure food reaches those in need. Government spending and institutional quality have emerged as important factors of reducing energy poverty. Government spending on energy infrastructure and access to clean energy technologies is essential for expanding energy access to under-served populations. Investments in infrastructure such as electricity grids, renewable energy projects, and clean cooking facilities are crucial for improving energy access and reducing reliance on traditional, polluting energy sources. Furthermore, institutional quality, including good governance, regulatory frameworks, and effective institutions, is essential for attracting investment and ensuring the efficient delivery of energy services. Transparent and accountable institutions can create an enabling environment for private sector investment in energy infrastructure and services, fostering innovation and competition. Programs aimed at reducing energy poverty should prioritize investments in energy infrastructure, institutional capacity building, and FDI attraction. By focusing on these areas, governments can expand energy access, improve energy efficiency, and reduce reliance on polluting energy sources, thereby improving the quality of life for millions of people and contributing to sustainable development.

In the first essay, we analyse the impact of trade liberalization on unemployment in SSA. However, our current analysis does not address the issue of skill mismatch in the labor market and how it may be affected by trade liberalization. In fact, trade liberalization, can lead to changes in the composition of industries within an economy. Some industries may expand because of increased international trade, while others may contract. As a result, demand for certain skills may rise or fall, leading to a skills mismatch in the labour market. Our analysis also does not address the quality of jobs created by trade liberalization, including aspects such as wages, working conditions, and job security. Future researches could analyse greater in depth the quality of jobs created by trade liberalization. In fact, trade liberalization can lead to increased competition, productivity gains, and economic growth, which may result in higher wages for workers but an increased competition from international markets can also put downward pressure on wages, especially in industries that face increased import competition. The working conditions also improve or decline due to trade liberalization. A sectoral analysis to determine which industries benefit most from trade liberalization and which may suffer job losses or an analysis of the impact of trade liberalization on informal employment are some nice insights for future researches.

In the second essay, we analyse the impact of cereal import openness on food security in

SSA. However, the analysis focuses solely on cereal import openness and not on the impact of other non-cereal food products. We also did not analyse how cereal trade affects smallholder farmers' livelihoods and food security. Future researches could conduct a supply chain analysis to understand how cereal trade affects the entire food supply chain, from production to consumption. In this essay we do not either address the nutrition side of food security. In fact, trade liberalization can increase access to a wider variety of foods. This can lead to improved dietary diversity, as consumers have access to a broader range of nutritious foods. However, increased availability of processed and unhealthy foods because of trade liberalization may also lead to an increase in the consumption of unhealthy, high-calorie, low-nutrient foods, potentially leading to negative health outcomes such as obesity and diet-related diseases. Additional researches analysing the impact of cereal trade on nutrition outcomes like dietary diversity and micro nutrient intake would be a plus.

In the third essay, we analyse the impact of tariffs rate reduction on energy poverty in SSA. However, we do not analyse how technological innovation and research and development investment can enhance the benefits of trade liberalization for energy poverty alleviation. We also do not investigate how tariffs rate reduction can affect the urban-rural divide. In fact, trade liberalization can have different effects on urban and rural areas, potentially exacerbating or alleviating existing disparities in access to resources and opportunities. Trade liberalization can increase access to modern energy sources by reducing tariffs on imported energy products and increasing competition in the energy market. However, regions with limited infrastructure and connectivity may struggle to take advantage of new trade opportunities, leading to disparities in access to modern energy sources between regions. Future researches could then explore regional disparities in access to clean energy technologies and how trade liberalization may exacerbate or mitigate these disparities.

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Résumé en français

La réduction des barrières commerciales au cours des dernières décennies à l'échelle mondiale ainsi que la promotion du libre-échange ont été l'objet de nombreux débats parmi les économistes. Le discours entourant la libéralisation des échanges constitue un point central de controverse dans les discussions relatives aux politiques économiques mondiales. L'intégration à l'économie mondiale s'est révélée être un puissant levier permettant aux pays de favoriser la croissance économique, le développement et la réduction de la pauvreté. Depuis 1947, avec l'établissement de l'Accord général sur les tarifs douaniers et le commerce (GATT), le commerce international a été un moteur de croissance.

À la suite de la création du GATT, plusieurs cycles de négociations multilatérales sur la libéralisation des échanges ont été menés à bien. Le système commercial mondial a bénéficié non seulement de ces négociations multilatérales mais aussi de politiques de libéralisation unilatérales et régionales. Deux cycles de négociations majeurs, à savoir le cycle d'Uruguay achevé en 1994 et le cycle de Doha finalisé en 2008, ont conduit à la création de l'Organisation mondiale du commerce (OMC) en vue de renforcer l'architecture des accords commerciaux multilatéraux. L'OMC joue également un rôle clé dans le règlement des différends commerciaux à travers son mécanisme de règlement des différends (Dispute Settlement Understanding, DSU). Depuis sa création en 1995, l'OMC a résolu 623 différends, en faisant l'un des mécanismes de règlement des litiges les plus actifs au niveau international. Le DSU a notamment bénéficié aux pays en développement, permettant à plusieurs d'entre eux d'obtenir gain de cause contre des économies avancées.

On peut citer, par exemple, le cas du différend opposant le Brésil aux États-Unis concernant les subventions américaines au coton. En 2002, le Brésil a contesté certaines subventions agricoles octroyées par les États-Unis à leurs producteurs de coton, arguant qu'elles violaient les règles de l'OMC et faussaient le commerce mondial du coton. En 2014, l'OMC a statué en faveur du Brésil, concluant que certaines de ces subventions étaient incompatibles avec les engagements des États-Unis au sein de l'OMC. Cette affaire a illustré la capacité des pays en développement à contester les politiques agricoles des pays développés grâce au mécanisme de règlement des différends de l'OMC. Un autre cas emblématique est celui de l'Indonésie contre l'Union européenne (UE), où

l'Indonésie a contesté les droits antidumping imposés par l'UE sur les importations de biodiesel indonésien. En 2018, l'OMC a donné raison à l'Indonésie, estimant que l'UE avait enfreint certaines exigences procédurales de l'Accord antidumping de l'OMC.

Plusieurs pays en développement, notamment en Asie et en Amérique latine, ont connu des avancées significatives en matière d'intégration économique, réussissant à attirer des investissements directs étrangers grâce à leur participation accrue aux échanges internationaux. Des pays comme la Chine, l'Inde, la Corée du Sud et Singapour ont adopté des réformes de libéralisation commerciale qui ont soutenu leur développement économique. Toutefois, cette progression demeure inégale, certaines régions comme l'Afrique et le Moyen-Orient enregistrant des avancées beaucoup plus lentes, voire un recul de leur part dans le commerce mondial.

Cette disparité alimente le débat opposant les partisans du libre-échange aux défenseurs du protectionnisme. D'un côté, les tenants du libre-échange soulignent les avantages que les pays peuvent tirer en se spécialisant dans la production de biens pour lesquels ils disposent d'un avantage comparatif. Ils avancent que l'ouverture commerciale stimule l'innovation technologique en favorisant la concurrence et la diffusion des connaissances (Mwaba, 2000). D'un autre côté, les protectionnistes mettent en garde contre les effets négatifs de la libéralisation, arguant qu'elle pourrait freiner la croissance et fragiliser les économies en développement. Ainsi, depuis les années 1950, l'économie mondiale a été marquée par d'importantes transformations dans la structure du commerce international, avec une augmentation de la valeur des échanges commerciaux (Maddison et OCDE, 1989).

L'avènement de l'industrialisation rapide en Asie de l'Est et en Asie du Sud, notamment en Inde et en Chine, a renforcé l'argument en faveur de la libéralisation commerciale (Krueger, 1980 ; OMC, 2013). Cependant, d'autres auteurs soulignent que les bénéfices de cette ouverture ne sont pas répartis équitablement entre les pays ni au sein des sociétés (Krugman, 2002 ; Wade, 2005).

En Afrique subsaharienne, la libéralisation du commerce a été un élément central des réformes économiques au cours des dernières décennies, notamment à travers les programmes d'ajustement structurel des années 1980 et 1990 promus par le Fonds monétaire international (FMI) et la Banque mondiale. Par ailleurs, plusieurs communautés économiques régionales, telles que la Communauté économique des États de l'Afrique de l'Ouest (CEDEAO), la Communauté d'Afrique de l'Est (EAC) et la Communauté de développement de l'Afrique australe (SADC), ont mis en place des zones de libre-échange et des unions douanières pour réduire les barrières commerciales intra-régionales.

Plus récemment, l'Accord de libre-échange continental africain (ZLECAf), signé en 2018 par 44 pays, vise à créer la plus grande zone de libre-échange au monde en termes de population

(1,3 milliard d'habitants). Son objectif est de dynamiser le commerce intra-africain et de favoriser la croissance économique à l'échelle du continent. Toutefois, malgré ces efforts, la croissance des échanges commerciaux en Afrique subsaharienne reste limitée, en particulier pour les exportations manufacturières. Par exemple, au Kenya, la libéralisation des années 1990 a coïncidé avec une hausse des prix de l'électricité, ce qui a pénalisé le secteur manufacturier. L'emploi dans le secteur textile, qui comptait plus de 200 000 travailleurs dans les années 1990, est tombé à moins de 35 000 à la fin de la décennie (Girdner et Siddiqui, 2008 ; Otieno, 2006).

L'Afrique subsaharienne fait face à plusieurs défis structurels entravant son intégration commerciale, notamment des infrastructures insuffisantes (réseaux de transport inadéquats, infrastructures énergétiques limitées et faibles capacités portuaires augmentent les coûts de transaction et entravent le commerce), les barrières non tarifaires (les obstacles réglementaires et administratifs compliquent l'exportation et l'importation de biens), le manque de capacités institutionnelles (l'absence d'expertise technique et de cadres réglementaires solides freine la mise en œuvre des politiques commerciales) et la dépendance aux matières premières (la vulnérabilité aux fluctuations des prix des matières premières expose la région à des chocs externes affectant sa stabilité économique). Néanmoins, le continent présente également d'importantes opportunités. L'abondance des ressources naturelles, la croissance démographique et l'essor d'une classe moyenne émergente constituent des moteurs potentiels pour une expansion commerciale accrue. En renforçant les politiques de libéralisation et en améliorant l'environnement commercial, les pays africains pourraient davantage s'intégrer aux chaînes de valeur mondiales et promouvoir un développement économique durable.

Les Objectifs de Développement Durable (ODD) sont un ensemble de 17 objectifs globaux adoptés par l'Assemblée générale des Nations Unies en septembre 2015. Ils succèdent aux Objectifs du Millénaire pour le Développement (OMD) et constituent un cadre ambitieux et exhaustif visant à relever les défis sociaux, économiques et environnementaux les plus pressants à l'horizon 2030. Ces objectifs visent à éradiquer la pauvreté, protéger la planète et assurer la prospérité pour tous. Toutefois, plusieurs pays en développement, notamment ceux de l'Afrique subsaharienne (ASS), accusent un retard significatif dans leur progression vers ces objectifs.

De multiples crises, telles que les conflits armés, le changement climatique et les effets persistants de la pandémie de COVID-19, compromettent les avancées vers les ODD. La reprise économique mondiale post-COVID-19 reste lente, en particulier en ASS, où les économies ont été sévèrement affectées. Par ailleurs, les conséquences des guerres et des conflits dans la région, conjuguées à la crise climatique, entravent également la progression des ODD.

Dans notre thèse, nous nous concentrons sur trois ODD spécifiques : l'ODD 8 (Travail décent et croissance économique), l'ODD 2 (Faim zéro) et l'ODD 7 (Énergie propre et d'un coût

abordable). Le choix de ces trois objectifs repose sur leur pertinence pour l'Afrique subsaharienne ainsi que sur le fait que, d'un point de vue théorique et empirique, la libéralisation commerciale peut exercer une influence significative sur ces enjeux dans la région.

ODD 8 : Travail décent et croissance économique

L'ODD 8 vise à promouvoir un emploi plein et productif, notamment à travers l'objectif 8.5 qui ambitionne d'assurer, d'ici 2030, un emploi décent pour tous les hommes et femmes, ainsi que l'objectif 8.6 qui vise à réduire substantiellement la proportion des jeunes sans emploi.

Le chômage constitue une problématique majeure en Afrique subsaharienne, avec 34 millions de personnes sans emploi en 2019 (OIT, 2019) et un taux de chômage régional de 6,8 %, supérieur à la moyenne mondiale de 5 %. De plus, le chômage affecte davantage les femmes (7,5 %) que les hommes (6,3 %).

La libéralisation du commerce peut avoir un impact direct sur l'emploi. Les théorèmes de Heckscher-Ohlin et Stolper-Samuelson (HOS) constituent les fondements théoriques majeurs des discussions sur l'effet de l'ouverture commerciale sur le marché du travail. Pour les pays en développement, le modèle HOS prévoit une augmentation de la demande de main-d'œuvre en raison de l'ouverture commerciale. Un autre effet attendu de la libéralisation commerciale est son impact indirect sur le marché du travail. Selon Stolper et Samuelson (1941), un régime commercial ouvert favorise la création d'emplois dans le secteur formel, accroît la demande de main-d'œuvre peu qualifiée et bénéficie ainsi aux travailleurs en augmentant leur salaire réel.

ODD 2 : Faim zéro et sécurité alimentaire

L'ODD 2 vise à éradiquer la faim, garantir la sécurité alimentaire, améliorer la nutrition et promouvoir une agriculture durable. L'objectif 2.1 de cet ODD ambitionne d'éliminer la faim d'ici 2030 et d'assurer à tous, en particulier aux populations vulnérables, un accès tout au long de l'année à une alimentation saine, nutritive et suffisante.

La sécurité alimentaire demeure un défi majeur en Afrique subsaharienne, où plus d'un tiers des personnes sous-alimentées dans le monde sont situées en Afrique, soit 282 millions en 2020 (46 millions de plus qu'en 2019 ; FAO, 2021).

D'un point de vue théorique, le commerce international peut favoriser la production agricole à travers son influence sur les prix. En effet, la libéralisation commerciale permet aux producteurs d'accéder à une demande plus large, favorisant ainsi l'augmentation de leur production et de leurs revenus. De plus, l'ouverture commerciale encourage l'exportation de produits nécessitant l'utilisation intensive d'un facteur abondant dans les pays en développement, à savoir la main-d'œuvre peu qualifiée, générant ainsi des opportunités d'emploi et augmentant les revenus des

ménages (théorème de Stolper-Samuelson ; Dithmer et Abdulai, 2017).

Selon Jaffee et al. (2011), ce processus contribue à la réduction de la pauvreté et à l'amélioration de la sécurité alimentaire. De plus, la libéralisation des échanges peut faciliter l'accès aux produits alimentaires à travers l'aide alimentaire. En effet, une plus grande ouverture commerciale d'un pays augmente ses possibilités de recevoir une aide alimentaire (FAO, 2005).

ODD 7 : Énergie propre et d'un coût abordable

L'ODD 7 vise à garantir l'accès de tous à des services énergétiques fiables, durables et modernes à un coût abordable. La pauvreté énergétique reste une problématique majeure en Afrique subsaharienne, caractérisée par une faible électrification et une forte dépendance aux combustibles de cuisson inefficaces.

En 2021, 675 millions de personnes dans le monde vivaient encore sans accès à l'électricité, dont quatre sur cinq en Afrique subsaharienne. Plus précisément, 567 millions de personnes n'avaient pas accès à l'électricité en 2021.

D'un point de vue théorique, selon le modèle de Heckscher-Ohlin, une réduction des droits de douane sur les importations peut contribuer à abaisser le coût des technologies d'énergie propre, les rendant ainsi plus accessibles. Par ailleurs, la théorie de la croissance endogène suggère que l'ouverture commerciale favorise l'innovation et le transfert de technologies, ce qui stimule la croissance économique (Romer, 1990). Cette croissance peut à son tour fournir les ressources nécessaires pour améliorer les infrastructures énergétiques et l'accès à l'énergie.

Le théorème de Stolper-Samuelson corrobore cette idée en montrant que la libéralisation commerciale bénéficie au facteur de production le plus abondant, qui, dans de nombreux pays en développement, est la main-d'œuvre (Stolper et Samuelson, 1941). Une hausse de l'emploi et des revenus grâce à l'ouverture commerciale permettrait aux ménages d'accéder à des sources d'énergie plus propres.

Enfin, l'hypothèse de l'échelle énergétique (energy ladder hypothesis) postule que l'augmentation des revenus des ménages les amène à substituer progressivement les combustibles traditionnels (bois, charbon) par des sources d'énergie modernes, réduisant ainsi la pauvreté énergétique (Hosier et Dowd, 1987).

La libéralisation commerciale peut jouer un rôle déterminant dans l'atteinte des ODD en Afrique subsaharienne, en influençant directement ou indirectement l'emploi, la sécurité alimentaire et l'accès à l'énergie propre. Toutefois, les effets de cette ouverture restent complexes et nécessitent une approche nuancée, intégrant les particularités structurelles et institutionnelles des économies africaines. L'analyse empirique approfondie de ces interactions permettra de mieux comprendre les mécanismes sous-jacents et d'orienter les politiques commerciales et de

développement dans la région.

Étant donné la pertinence manifeste de ces enjeux pour la région, l'objectif général de cette recherche est d'analyser l'impact de la libéralisation commerciale sur les problématiques socio-économiques en Afrique subsaharienne. Plus précisément, il s'agit d'analyser l'impact de la libéralisation commerciale sur le chômage, d'évaluer l'effet de la libéralisation commerciale sur la sécurité alimentaire et d'examiner l'impact de la libéralisation commerciale sur la pauvreté énergétique. Cette recherche défend la thèse selon laquelle la libéralisation des échanges a un effet positif en contribuant à réduire le chômage, améliorer la sécurité alimentaire et diminuer la pauvreté énergétique. Ces thématiques sont abordées sous la forme de trois essais, chacun se concentrant sur l'un de ces enjeux socio-économiques.

Notre travail apporte plusieurs contributions académiques. Concernant le premier essai, notre recherche enrichit la littérature existante en évaluant l'impact de la libéralisation commerciale sur le taux de chômage, en mettant particulièrement l'accent sur le chômage des jeunes et les disparités de genre (taux de chômage des hommes et des femmes) en Afrique subsaharienne. Cette approche est novatrice, car les études existantes sur le sujet se concentrent généralement sur des analyses spécifiques à un seul pays ou portent moins d'attention à cette région.

Dans le deuxième essai, nous apportons de nouvelles preuves empiriques sur l'impact de la libéralisation commerciale sur la sécurité alimentaire en Afrique subsaharienne, avec une focalisation spécifique sur le commerce des céréales. Ces produits agricoles sont essentiels pour la sécurité alimentaire de la région, mais ils ont été relativement négligés dans les analyses empiriques sur la relation entre commerce et sécurité alimentaire.

Enfin, dans le troisième essai, à notre connaissance, aucune étude empirique n'a jusqu'à présent analysé l'impact de la libéralisation commerciale sur la pauvreté énergétique en Afrique subsaharienne. Notre travail fournit ainsi des résultats empiriques inédits sur cette question, contribuant à combler une lacune importante dans la littérature économique et à éclairer les décisions de politiques publiques en matière d'accès à l'énergie.

Pour analyser ces questions, nous utilisons différentes périodes d'étude, bases de données et ensembles de pays, en fonction de la disponibilité des données pour les variables clés. Les données mobilisées dans cette thèse proviennent de diverses sources internationales, notamment la base de données des Indicateurs du développement mondial (WDI) de la Banque mondiale, les statistiques de l'Organisation internationale du travail (OIT), les statistiques de l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO) ainsi que la base de données World Integrated Trade Solutions (WITS).

Cette thèse constitue une contribution importante à la littérature empirique sur la

libéralisation commerciale en Afrique subsaharienne, une région qui demeure l'une des moins étudiées dans le monde en matière de commerce international. Elle enrichit également la littérature sur des problématiques essentielles, à savoir le chômage, la sécurité alimentaire et la pauvreté énergétique dans cette région.

Les trois essais de la thèse sont résumés comme suit.

Essai 1

Le premier essai, intitulé « L'impact de la libéralisation commerciale sur le chômage dans les pays d'Afrique subsaharienne », examine dans un premier temps l'effet global de la libéralisation des échanges sur le taux de chômage. Ensuite, l'analyse distingue le taux de chômage des hommes et celui des femmes afin d'évaluer d'éventuelles disparités de genre. Enfin, nous testons l'impact spécifique de la libéralisation commerciale sur le chômage des jeunes.

Le chômage représente l'un des principaux défis économiques en Afrique subsaharienne. Un régime commercial plus ouvert pourrait favoriser la création d'emplois dans le secteur formel, accroître la demande de main-d'œuvre peu qualifiée et ainsi bénéficier aux travailleurs en augmentant leurs salaires réels. Les théorèmes bien connus de Heckscher-Ohlin et de Stolper-Samuelson constituent les fondements théoriques majeurs des discussions sur l'impact de la libéralisation commerciale sur les marchés du travail. Le théorème de Stolper-Samuelson explique notamment les effets de la libéralisation du commerce sur la répartition des revenus entre les facteurs de production. Il prédit que le protectionnisme augmente la rémunération du facteur de production le plus rare, qui est le travail dans les pays développés et le capital dans les pays en développement. Dans ces derniers, le modèle Heckscher-Ohlin prévoit ainsi une augmentation de la demande de main-d'œuvre en raison de l'ouverture commerciale.

L'ouverture des échanges et la réduction des barrières commerciales ont été au cœur des débats économiques au cours des dernières décennies. Un des effets escomptés de cette libéralisation est l'accélération de la croissance économique et l'amélioration du bien-être des populations (FMI, 2001). Toutefois, bien que le chômage constitue un défi économique majeur, la plupart des modèles de commerce international supposent un emploi complet, ce qui les rend peu adaptés à l'étude du lien entre commerce et emploi (Dutt et al., 2009).

Cependant, une littérature émergente s'intéresse à cette relation (Hasan et al., 2012). Selon le théorème de Stolper-Samuelson (1941), un régime commercial plus ouvert peut favoriser la création d'emplois dans le secteur formel, accroître la demande de main-d'œuvre peu qualifiée et ainsi améliorer les salaires réels. Les théorèmes de Heckscher-Ohlin et Stolper-Samuelson sont les bases théoriques majeures des discussions sur l'impact de la libéralisation commerciale sur les marchés du travail.

En Afrique subsaharienne, la littérature sur cette question reste limitée, principalement en raison du manque de données. Peu d'études ont exploré les ajustements du marché du travail liés aux réformes commerciales. Pourtant, en 2019, près de 34 millions de personnes étaient au chômage en Afrique, soit un taux de chômage régional de 6,8 %, supérieur à la moyenne mondiale de 5 % (OIT, 2019). Ce phénomène est accentué par des disparités de genre : le taux de chômage des femmes (7,5 %) est plus élevé que celui des hommes (6,3 %).

Face à ces enjeux, l'objectif dans cet essai est d'analyser l'impact de la libéralisation commerciale sur le chômage en Afrique subsaharienne, en mettant un accent particulier sur les différences entre hommes et femmes ainsi que sur le chômage des jeunes. Contrairement aux études existantes qui se concentrent sur des pays spécifiques, cette thèse couvre un échantillon de 37 pays sur la période 2000-2019 et adopte une approche économétrique dynamique afin de surmonter les limites liées aux données.

Quatre principaux modèles théoriques analysent l'impact du commerce sur le chômage. Le modèle ricardien postule que les pays se spécialisent dans la production des biens pour lesquels ils ont un avantage comparatif. Cette spécialisation entraîne une réallocation des facteurs de production et peut ainsi avoir un effet positif ou négatif sur l'emploi selon la structure de l'économie (Krugman et Obstfeld, 2009). Le modèle Heckscher-Ohlin-Samuelson (HOS) affirme que les pays exporteront les biens intensifs dans le facteur de production qui est relativement abondant. Pour les pays en développement, riches en main-d'œuvre, la libéralisation commerciale est censée augmenter la demande de travail et réduire le chômage. Le modèle spécifique par secteur (Viner, 1932) indique que la libéralisation commerciale modifie les prix relatifs, ce qui bénéficie aux secteurs exportateurs et pénalise les secteurs qui subissent la concurrence des importations. Certains travailleurs peuvent ainsi être perdants, en fonction de leur secteur d'activité. Le modèle de réallocation intra-sectorielle montre que, plutôt que de redistribuer les travailleurs entre secteurs, le commerce conduit à une sélection des entreprises les plus productives, qui créent des emplois, tandis que les moins productives disparaissent (Krugman et Obstfeld, 2009). Ces modèles suggèrent que le commerce peut influencer l'emploi différemment selon les structures économiques et institutionnelles des pays.

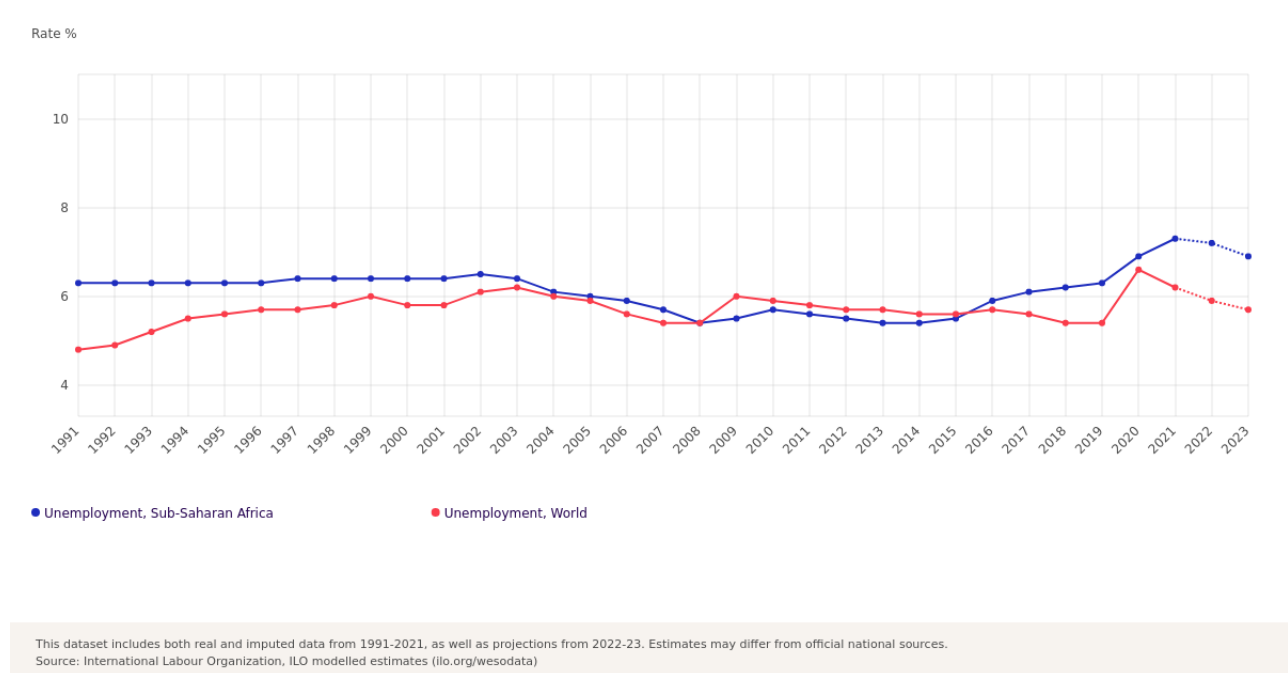
L'impact de la libéralisation commerciale sur l'emploi fait l'objet de résultats contrastés. Certains travaux montrent que la libéralisation réduit le chômage et améliore les salaires (Dutt et al., 2009 ; Porto, 2008), tandis que d'autres soulignent qu'elle peut accentuer le chômage et les inégalités salariales (Revenga, 1997 ; Currie et Harrison, 1997).

En Afrique, quelques études existent, mais elles restent limitées. Par exemple, Erten et al. (2019) ont observé une baisse de l'emploi manufacturier en Afrique du Sud après une réforme tarifaire, tandis que Njikam (2016) a trouvé que la libéralisation a renforcé la demande de main-

d'œuvre non qualifiée au Cameroun. D'autres études, comme celles de McMillan et McCaig (2019) au Botswana, montrent un accroissement du travail informel après la libéralisation.

L'analyse des tendances du chômage en Afrique subsaharienne révèle que la région connaît des taux de chômage structurellement élevés. Les données de l'OIT (1991-2023) montrent que le chômage en Afrique subsaharienne est supérieur à celui de l'Asie du Sud et de l'Asie de l'Est. De plus, les femmes et les jeunes sont particulièrement vulnérables face au chômage. Face à ce défi, plusieurs initiatives ont été mises en place, notamment la stratégie de la CEDEAO pour l'employabilité des jeunes dans les secteurs agro-sylvo-pastoral et halieutique (2019) et l'accord de la Communauté d'Afrique de l'Est avec la FAO pour promouvoir l'emploi des jeunes en milieu rural. Ces initiatives témoignent de la volonté politique de lutter contre le chômage dans la région.

Figure 3.6: Taux de chômage en Afrique subsaharienne et dans le monde



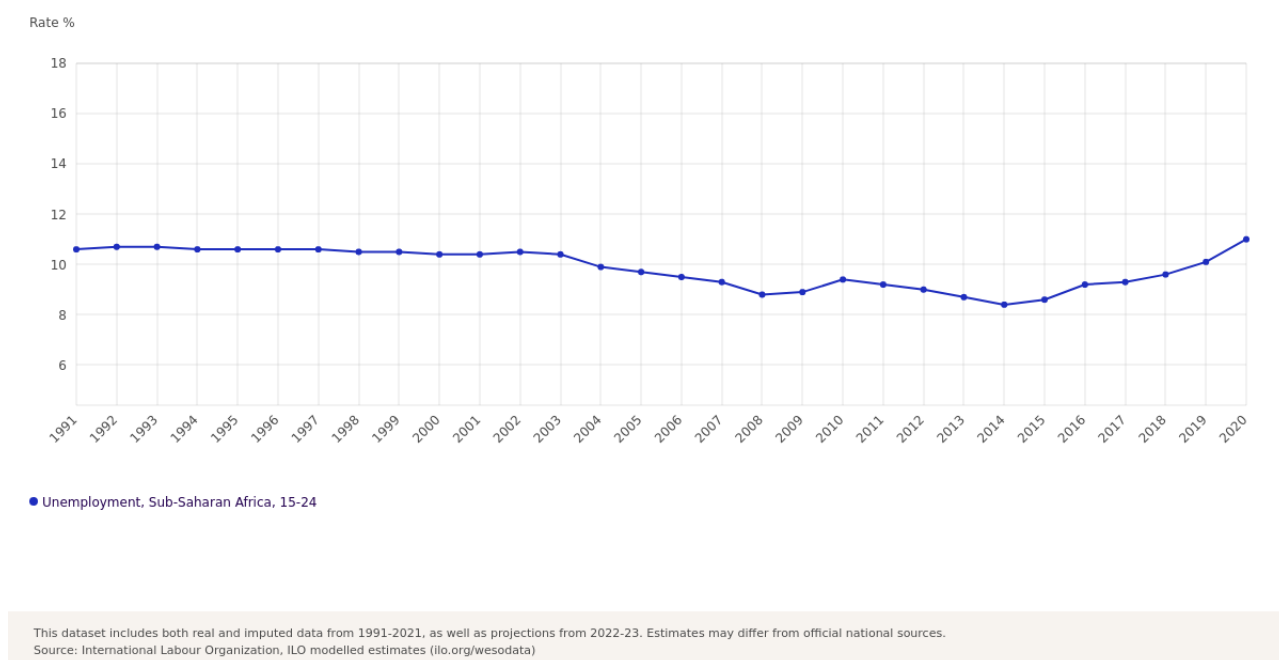
Source: Organisation internationale du travail (OIT)

Figure 3.7: Taux de chômage par genre



Source: Organisation internationale du travail (OIT)

Figure 3.8: Chômage des jeunes



Source: Organisation internationale du travail (OIT)

La recherche repose sur des données couvrant la période 2000-2019 pour 37 pays d'Afrique subsaharienne. Les principales sources de données incluent les Indicateurs du développement

mondial (WDI) de la Banque mondiale et les statistiques de l'OIT.

L'approche méthodologique repose sur une modélisation dynamique utilisant la méthode des moments généralisés (GMM) afin de contrôler l'endogénéité. Les modèles estiment l'effet de la libéralisation sur le chômage total, masculin, féminin et des jeunes.

Les résultats montrent que la libéralisation commerciale a un effet significatif et négatif sur le chômage en Afrique subsaharienne.

Une augmentation de l'ouverture commerciale est associée à une réduction du taux de chômage global. L'effet est plus marqué pour le chômage féminin, ce qui suggère que la libéralisation favorise l'emploi des femmes, notamment dans les secteurs manufacturiers et agro-industriels. Les jeunes bénéficient également de l'ouverture commerciale, ce qui pourrait être lié aux opportunités d'emploi dans les industries exportatrices. Les contrôles de robustesse (régressions à effets fixes) confirment ces résultats.

Cette étude met en évidence le rôle crucial de la libéralisation commerciale dans la réduction du chômage en Afrique subsaharienne. Les décideurs doivent poursuivre les politiques de libéralisation du commerce en réduisant les barrières tarifaires et non tarifaires pour intégrer davantage l'Afrique aux chaînes de valeur mondiales. Les investissements en infrastructures et en formation doivent être renforcés pour maximiser les gains d'emploi liés à la libéralisation. Les politiques de genre doivent être encouragées afin d'améliorer l'accès des femmes aux emplois formels. Des programmes d'insertion professionnelle des jeunes doivent être développés pour exploiter le potentiel démographique de la région. Cette étude constitue une avancée importante dans la compréhension des effets du commerce sur l'emploi en Afrique, tout en soulignant les défis structurels qui persistent.

Essai 2

Dans ce deuxième essai, intitulé « L'impact du commerce des céréales sur la sécurité alimentaire : Évidences empiriques en Afrique subsaharienne », la problématique de l'insécurité alimentaire est abordée sous l'angle du commerce des céréales. L'objectif principal de cette étude est d'analyser l'effet de l'ouverture des importations céréalières sur la prévalence de la sous-alimentation en Afrique subsaharienne.

L'Objectif de Développement Durable 2 (ODD2) vise à éradiquer la faim dans le monde, mais l'Afrique subsaharienne demeure en retard dans l'atteinte de cet objectif. Cette région est particulièrement touchée par l'insécurité alimentaire, avec une augmentation significative du nombre de personnes sous-alimentées ces dernières années. Selon la FAO (2021), entre 720 et 811 millions de personnes souffraient de la faim en 2020 à l'échelle mondiale, une situation exacerbée par les effets persistants de la pandémie de COVID-19 et par la guerre entre l'Ukraine

et la Russie, qui ont aggravé l'insécurité alimentaire en Afrique d'au moins 30 % depuis 2020.

Depuis le début des années 2000, les pays africains ont mis en place plusieurs initiatives pour améliorer la sécurité alimentaire, notamment l'engagement de Maputo (2003), qui prévoyait de consacrer 10 % du budget national à l'agriculture. Cependant, ces efforts n'ont pas suffi à enrayer l'insécurité alimentaire. La Déclaration de Malabo (2014) a réaffirmé cet engagement, avec l'objectif d'éliminer la faim en Afrique d'ici 2025.

Dans ce contexte, l'ouverture commerciale est souvent perçue comme un levier potentiel pour améliorer la sécurité alimentaire. La théorie économique suggère que la libéralisation du commerce permettrait aux pays de mieux exploiter leurs avantages comparatifs, d'accroître la croissance économique et de réduire la pauvreté. Toutefois, les effets de cette ouverture sur la sécurité alimentaire sont ambigus.

Cet essai vise donc à examiner empiriquement l'effet de l'ouverture des importations céréalières sur la prévalence de la sous-alimentation en Afrique subsaharienne, en mettant en évidence les facteurs économiques et structurels influençant cette relation.

La sécurité alimentaire est définie par la FAO comme une situation où toutes les personnes ont un accès physique, économique et social à une nourriture suffisante, saine et nutritive leur permettant de mener une vie active et en bonne santé (Barrett, 2010 ; Shaw, 2007). Elle repose sur quatre dimensions essentielles : la disponibilité alimentaire (quantité suffisante de nourriture sur le marché), l'accès économique et physique (capacité des individus à acheter ou obtenir de la nourriture), l'utilisation des aliments : qualité nutritionnelle et sécurité sanitaire des denrées alimentaires et la stabilité (résilience face aux chocs économiques et climatiques). La libéralisation du commerce peut influencer ces quatre dimensions de plusieurs manières. D'un côté, elle peut améliorer l'accès à une plus grande diversité alimentaire et stabiliser les prix, mais elle peut aussi rendre les pays plus vulnérables aux fluctuations des prix mondiaux et aux dépendances extérieures.

L'échange de céréales est particulièrement crucial pour la sécurité alimentaire en Afrique subsaharienne, car ces produits constituent la principale source calorique pour plus de 962 millions de personnes (OCDE-FAO, 2016).

La relation entre commerce et sécurité alimentaire fait l'objet de nombreux débats académiques. Plusieurs études ont montré que la libéralisation commerciale favorise l'accessibilité et la disponibilité des denrées alimentaires (Anderson, 2016 ; Donaldson, 2018 ; Dithmer et Abdulai, 2017). Le commerce peut réduire la volatilité des prix, améliorer la productivité agricole grâce aux transferts technologiques et augmenter les revenus des ménages (Dorosh et al., 2009 ; FAO, 2003).

Cependant, d'autres recherches mettent en garde contre les risques d'une dépendance accrue

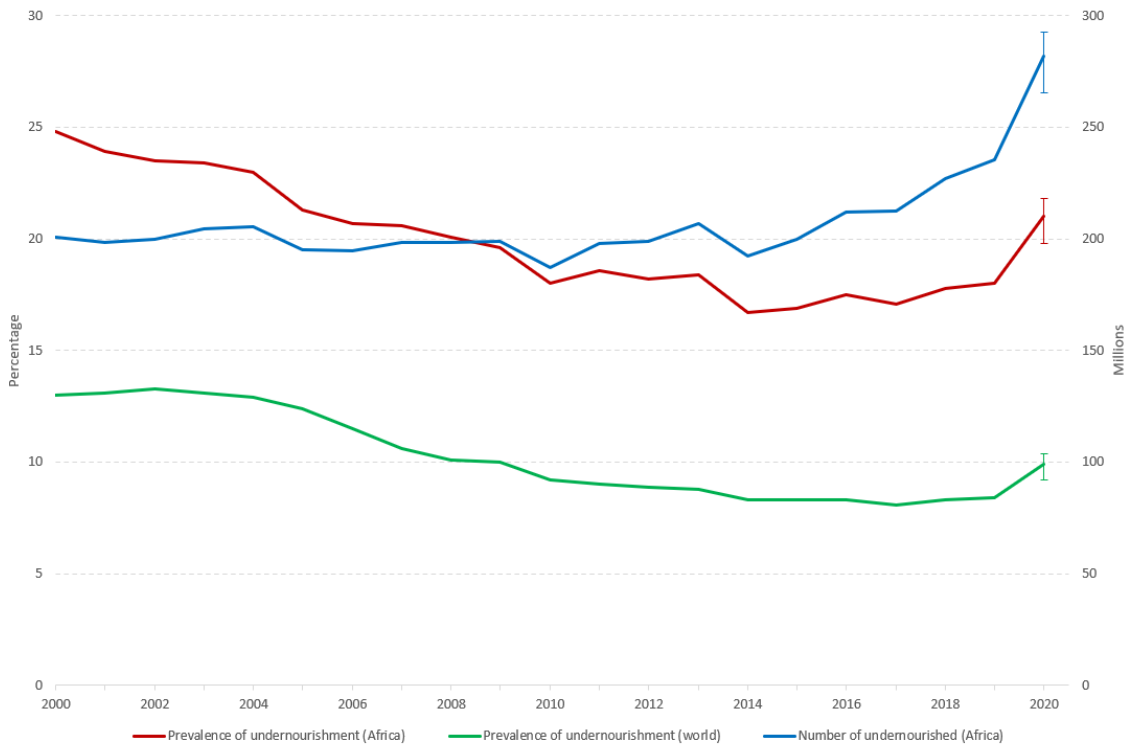
aux importations alimentaires (Devereux, 2009 ; Dreze et Sen, 1990). La dépendance aux importations peut entraîner une hausse des prix alimentaires en cas de choc externe, affectant ainsi la sécurité alimentaire des populations les plus vulnérables (Flachsbarth et Garrido, 2014 ; Mary, 2019).

Peu d'études se sont intéressées spécifiquement au commerce des céréales en Afrique subsaharienne. Marson et al. (2023) ont étudié l'impact du commerce des céréales sur la sous-alimentation dans les pays en développement, mais leurs résultats ne sont pas totalement représentatifs de l'Afrique, car leur échantillon inclut de grands exportateurs de céréales comme le Brésil, la Russie et l'Ukraine. Cet essai vise donc à combler cette lacune empirique.

Les données de la FAO montrent que la prévalence de la sous-alimentation en Afrique subsaharienne a augmenté, passant de 16,7 % en 2014 à 21 % en 2020, soit 125,1 millions de personnes sous-alimentées en Afrique de l'Est, 75,2 millions en Afrique de l'Ouest et 57,1 millions en Afrique centrale.

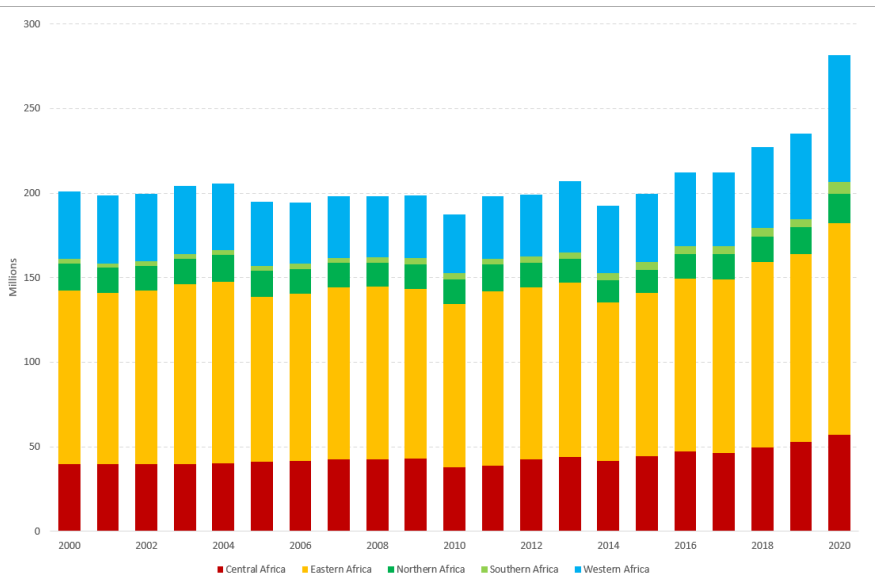
L'insécurité alimentaire est exacerbée par plusieurs facteurs structurels tels que les conflits et l'instabilité politique qui perturbent la production et le commerce des denrées alimentaires. Les changements climatiques, qui augmentent la fréquence des sécheresses et inondations. La dépendance aux importations céréalières, qui fragilise les économies locales. Malgré des politiques agricoles de soutien, la production locale de céréales reste insuffisante, et la plupart des pays de la région sont importateurs nets de céréales.

Figure 3.9: Prévalence de la sous-alimentation dans le monde et en Afrique, et nombre de personnes sous-alimentées en Afrique



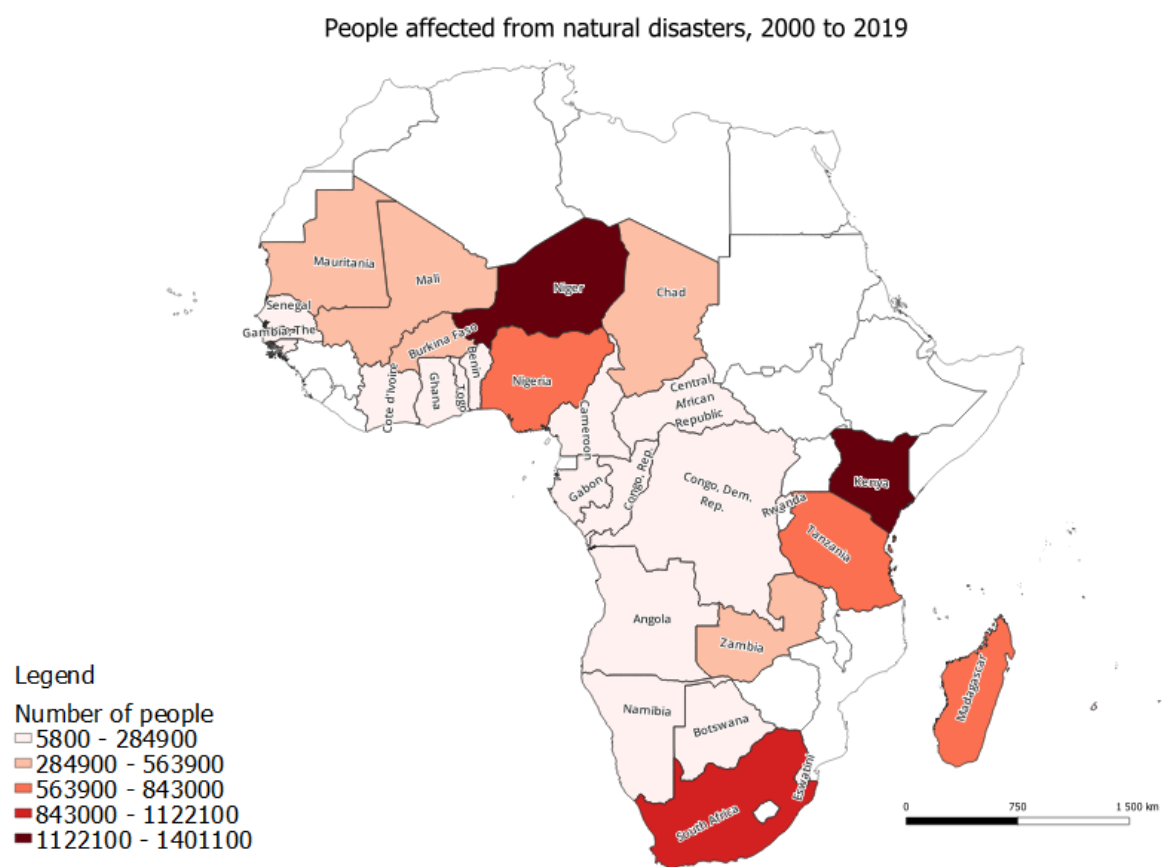
Source: FAOSTAT

Figure 3.10: Nombre de personnes sous-alimentées en Afrique par sous-région



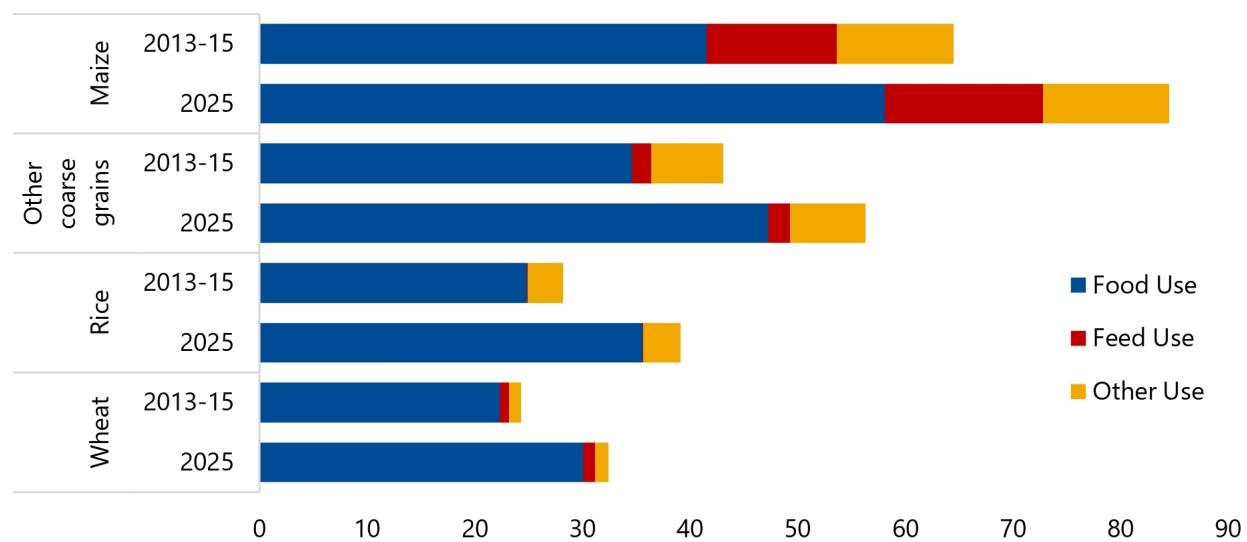
Source: FAOSTAT

Figure 3.11: Nombre total de personnes touchées par des catastrophes naturelles, 2000 - 2019



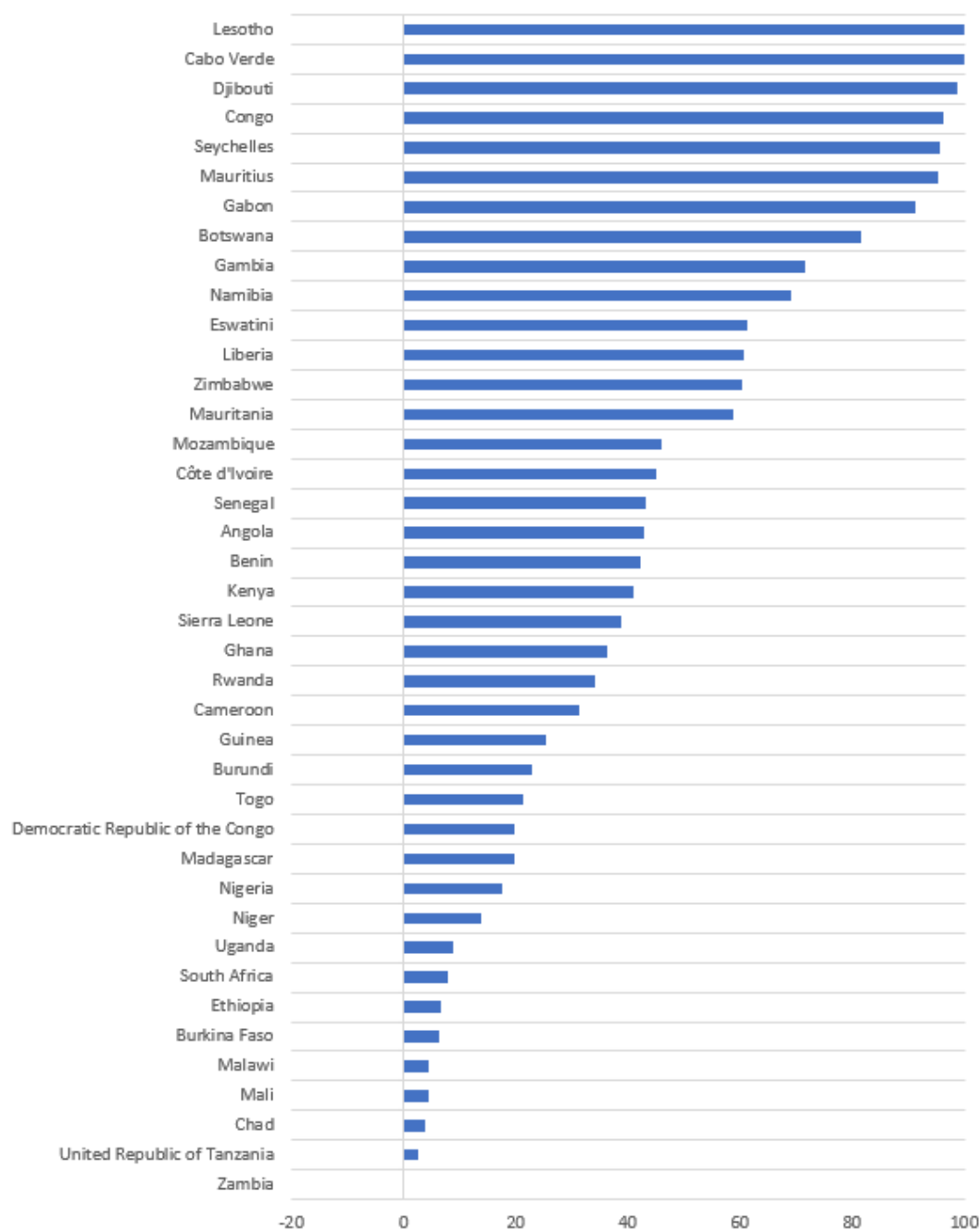
Source: Construction de l'auteur à partir des données de la base de données EM-DAT

Figure 3.12: Composition de la demande céréalière



Source: OECD/FAO (2016), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database)

Figure 3.13: Taux de dépendance à l'égard des importations de céréales, 2018



Source: FAOSTAT

L'étude couvre 27 pays d'Afrique subsaharienne sur la période 2000-2020. Les données proviennent de plusieurs sources, dont la FAO, la Banque mondiale et la base EM-DAT sur les catastrophes naturelles. L'indicateur principal utilisé pour mesurer la sécurité alimentaire est la prévalence de la sous-alimentation (FAO). L'ouverture aux importations céréalières est mesurée par les importations de céréales en pourcentage du PIB. L'estimation économétrique repose sur un modèle à effets fixes et une approche par variables instrumentales (2SLS-IV) pour traiter l'endogénéité.

Les résultats montrent que l'ouverture aux importations céréalières a un impact positif et significatif sur la prévalence de la sous-alimentation, ce qui suggère que l'ouverture commerciale accroît l'insécurité alimentaire en Afrique subsaharienne.

Les résultats montrent que la croissance du PIB contribue à la réduction de la sous-alimentation, soulignant ainsi le rôle crucial de l'expansion économique dans l'amélioration de la sécurité alimentaire. De même, une augmentation du rendement agricole ainsi que l'extension des surfaces cultivables ont un effet positif sur la disponibilité alimentaire. En revanche, le taux d'emploi apparaît corrélé positivement à la sous-alimentation, ce qui suggère que les emplois créés ne permettent pas toujours de garantir un revenu suffisant pour assurer un accès stable à une alimentation adéquate. Par ailleurs, la croissance démographique tend à accentuer l'insécurité alimentaire, exerçant une pression supplémentaire sur les ressources alimentaires disponibles. Enfin, des tests de robustesse réalisés à l'aide d'indicateurs alternatifs, tels que la disponibilité énergétique et l'apport protéique, confirment la validité de ces résultats.

L'étude met en évidence que la forte dépendance aux importations céréalières accentue la vulnérabilité de l'Afrique subsaharienne face aux chocs extérieurs, compromettant ainsi la sécurité alimentaire de la région. Pour y remédier, il est essentiel de renforcer la production agricole locale en investissant dans les infrastructures et les technologies agricoles afin d'améliorer la productivité et la résilience du secteur. Une diversification des sources d'approvisionnement apparaît également nécessaire afin de réduire la dépendance excessive aux importations et d'assurer une plus grande stabilité des approvisionnements alimentaires. Enfin, des politiques agricoles adaptées doivent être mises en place pour accroître la résilience aux chocs climatiques et économiques, garantissant ainsi une meilleure sécurité alimentaire et une moindre exposition aux fluctuations des marchés internationaux. Ces mesures combinées permettraient de rendre l'Afrique subsaharienne moins vulnérable et plus résiliente face aux crises alimentaires.

Essai 3

Dans le troisième essai intitulé « La réduction des tarifs douaniers permet-elle d'atténuer la pauvreté énergétique ? Évidences pour les pays d'Afrique subsaharienne », nous abordons la problématique de la pauvreté énergétique. Cet essai a été publié dans la revue *Energy Policy*.

La pauvreté énergétique demeure un défi majeur dans les pays en développement et constitue l'un des objectifs des Objectifs de Développement Durable (ODD7) des Nations Unies, qui vise à assurer l'accès universel à une énergie abordable, fiable, durable et moderne. L'accès limité à l'énergie affecte divers secteurs de l'économie et nuit aux efforts environnementaux, avec des conséquences directes sur la santé, l'éducation, la croissance économique et le bien-être des ménages. En 2021, 675 millions de personnes dans le monde n'avaient toujours pas

accès à l'électricité, dont 567 millions en Afrique subsaharienne. Par ailleurs, la dépendance aux combustibles traditionnels pour la cuisson demeure un problème, avec des effets négatifs sur la santé et l'environnement.

Cet essai examine l'impact de la réduction des tarifs douaniers sur la pauvreté énergétique en Afrique subsaharienne, en se focalisant sur l'accès aux combustibles propres et aux technologies modernes de cuisson. L'hypothèse centrale repose sur l'idée que la baisse des tarifs d'importation sur les équipements énergétiques modernes réduit leur coût et facilite leur adoption par les ménages et les entreprises. L'étude utilise un panel de 20 pays d'Afrique subsaharienne sur la période 2000-2020 et applique des techniques économétriques avancées pour capturer la relation de long terme entre libéralisation commerciale et pauvreté énergétique.

La relation entre commerce et accès à l'énergie repose sur plusieurs théories économiques qui expliquent les mécanismes par lesquels la libéralisation commerciale peut influencer l'adoption des technologies énergétiques modernes.

Selon le modèle Heckscher-Ohlin, la libéralisation commerciale bénéficie aux secteurs utilisant intensivement le facteur de production le plus abondant. Dans le cas des pays en développement, caractérisés par une abondance de main-d'œuvre, la réduction des droits de douane peut alors stimuler la demande de technologies énergétiques modernes et favoriser leur accessibilité.

L'hypothèse de l'échelle énergétique, formulée par Hosier et Dowd (1987), suggère que l'augmentation des revenus des ménages conduit à un passage progressif des combustibles traditionnels, comme le bois et le charbon, vers des sources d'énergie plus propres telles que l'électricité et le gaz. De son côté, la théorie de la croissance endogène, développée par Romer (1990), soutient que l'ouverture commerciale stimule l'innovation et favorise le transfert de technologies, ce qui engendre une croissance économique et permet d'accroître les investissements dans les infrastructures énergétiques.

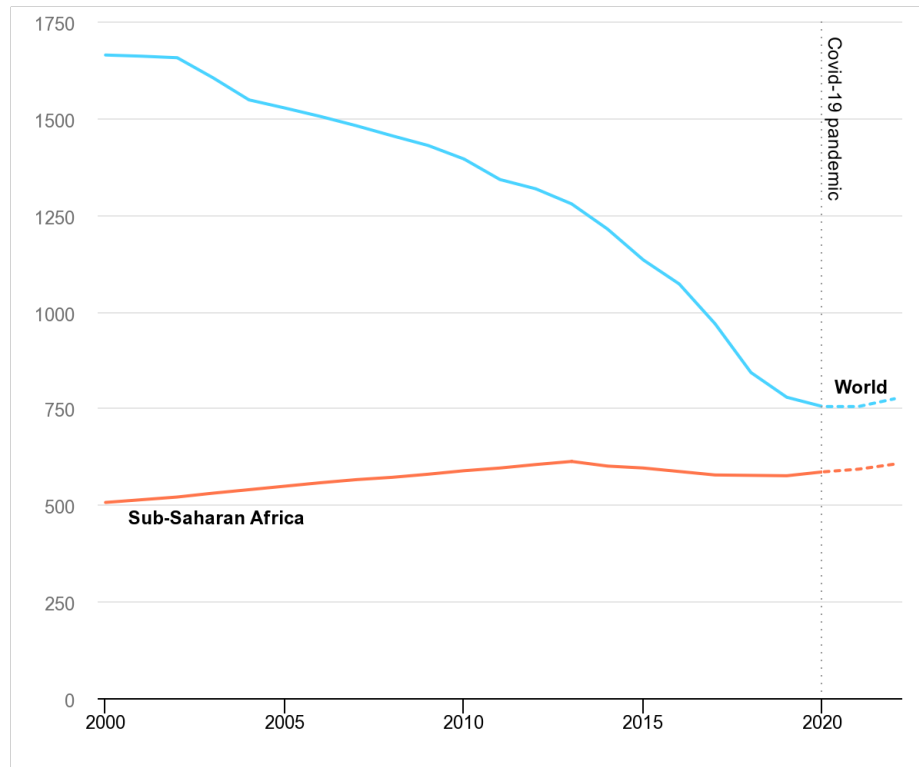
Enfin, le théorème de Stolper-Samuelson (1941) démontre que la libéralisation du commerce profite aux facteurs de production les plus abondants d'un pays. Dans les pays en développement, cela se traduit par une augmentation des revenus des travailleurs, facilitant ainsi leur accès à des sources d'énergie modernes.

Ces différentes approches convergent vers l'idée que la réduction des tarifs douaniers peut jouer un rôle clé dans l'atténuation de la pauvreté énergétique en facilitant l'importation des technologies énergétiques et en rendant ces équipements plus abordables.

Malgré des progrès au niveau mondial, l'Afrique subsaharienne reste la région où l'accès à l'électricité est le plus faible. En 2021, 567 millions de personnes n'avaient pas accès à l'électricité, soit près de 80 % des personnes vivant sans électricité dans le monde. L'accès aux combustibles propres et aux technologies modernes pour la cuisson est un enjeu majeur. En 2022, environ 2,3

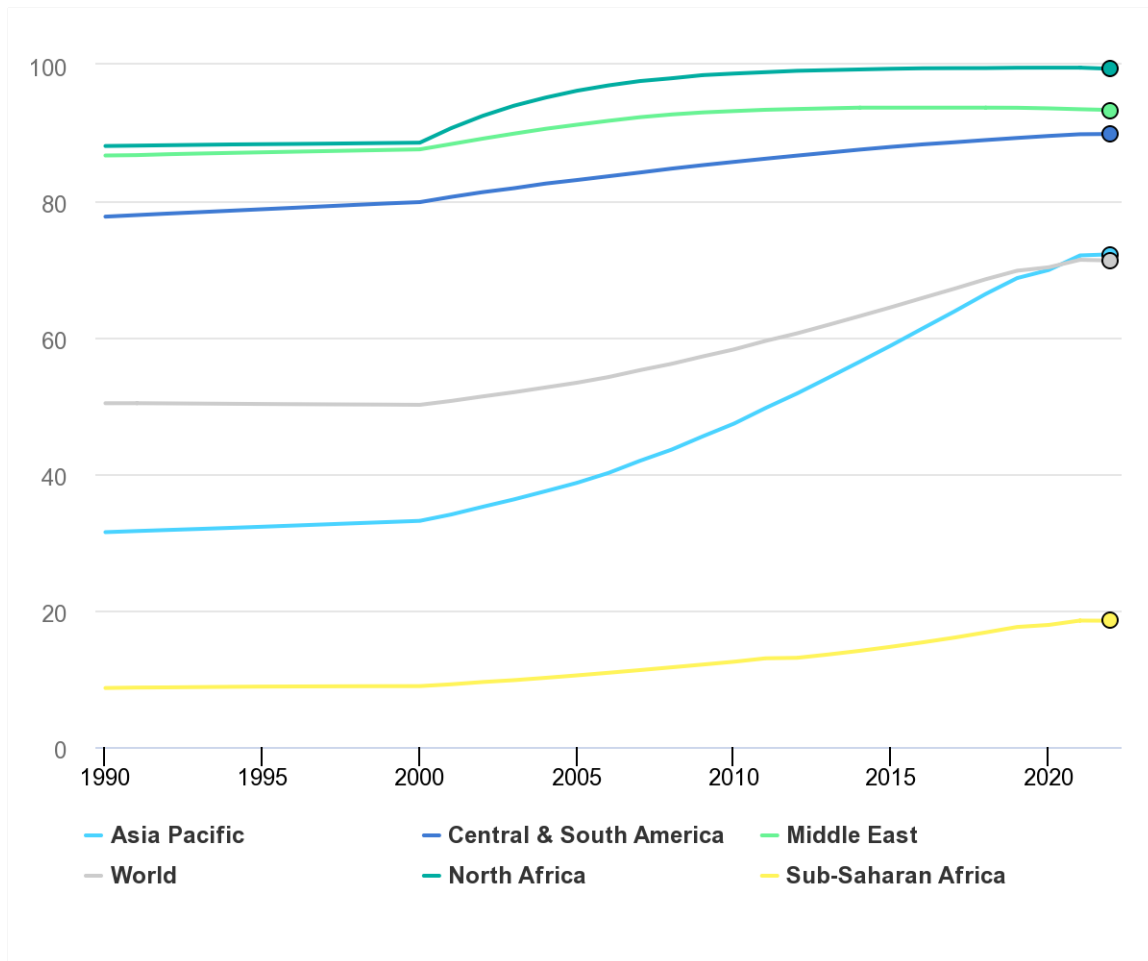
milliards de personnes dans le monde utilisaient encore des combustibles traditionnels pour la cuisson, et la part de la population utilisant des combustibles propres en Afrique subsaharienne était estimée à seulement 18,5 %. Cette dépendance aux combustibles polluants entraîne des problèmes de santé publique et contribue aux émissions de gaz à effet de serre.

Figure 3.14: Nombre de personnes n'ayant pas accès à l'électricité en Afrique subsaharienne et dans le monde, 2012-2022



Source: Rapport sur les objectifs de développement durable 2023

Figure 3.15: Part de la population ayant accès à des moyens de cuisson propres



Source: Base de données sur l'énergie domestique de l'AIE et de l'Organisation mondiale de la santé (OMS)

L'étude s'appuie sur un panel de 20 pays d'Afrique subsaharienne couvrant la période 2000-2020. Les données utilisées proviennent de plusieurs sources, notamment la Banque mondiale, le World Integrated Trade Solutions (WITS) et l'Agence internationale de l'énergie (IEA). L'analyse porte sur l'accès aux combustibles propres et aux technologies modernes pour la cuisson, qui constitue la variable dépendante. La variable explicative clé est le taux de droits de douane moyen pondéré appliqué aux produits importés, permettant d'évaluer l'effet de la libéralisation commerciale sur l'adoption des technologies énergétiques modernes. Afin d'obtenir des estimations robustes et de traiter d'éventuels problèmes d'endogénéité, plusieurs méthodes économétriques sont employées. Le modèle est d'abord estimé à l'aide de la méthode des moindres carrés ordinaires dynamiques (DOLS) pour capturer les relations de long terme. Ensuite, la méthode des moindres carrés entièrement modifiés (FMOLS) est utilisée afin de corriger les biais liés à l'endogénéité et à l'autocorrélation. Pour renforcer la fiabilité des résultats, une régression par corrélation canonique (CCR) est également appliquée. Enfin, un modèle à variables instrumentales (IV-2SLS) est mobilisé pour corriger les biais d'endogénéité potentiels,

garantissant ainsi la robustesse des estimations obtenues.

Les résultats de l'étude mettent en évidence que les réductions tarifaires ont un effet significatif et négatif sur la pauvreté énergétique, traduisant ainsi une relation positive entre la diminution des droits de douane et l'augmentation de l'accès aux combustibles propres ainsi qu'aux technologies modernes de cuisson. D'autres variables exercent également une influence significative sur l'accès à l'énergie. Une augmentation du PIB par habitant est associée à une amélioration de l'accès aux combustibles propres, suggérant que la hausse des revenus favorise l'adoption des technologies modernes. La consommation d'énergie renouvelable joue un rôle essentiel dans la réduction de la pauvreté énergétique en fournissant des alternatives viables aux combustibles fossiles. L'urbanisation contribue également à l'amélioration de l'accès aux énergies modernes, les infrastructures énergétiques étant généralement plus développées dans les zones urbaines que dans les zones rurales. En revanche, les émissions de CO₂ sont négativement corrélées à l'accès à une énergie propre, ce qui indique que les pays affichant des niveaux élevés d'émissions restent fortement dépendants des combustibles traditionnels.

Les tests de robustesse confirment la validité de ces résultats. Par ailleurs, une analyse complémentaire prenant en compte l'accès à l'électricité comme variable dépendante met en évidence un effet positif des réductions tarifaires sur l'électrification, renforçant ainsi l'idée que la libéralisation commerciale peut jouer un rôle clé dans l'amélioration de l'accès à l'énergie en Afrique subsaharienne.

Cette étude met en lumière le rôle déterminant du commerce dans la réduction de la pauvreté énergétique en Afrique subsaharienne. Les résultats obtenus montrent que la diminution des droits de douane sur les équipements énergétiques modernes facilite leur adoption et améliore ainsi l'accès à une énergie propre et abordable. D'un point de vue politique, plusieurs actions peuvent être envisagées pour renforcer cet impact. La promotion de la libéralisation commerciale, par une réduction des barrières tarifaires sur les équipements énergétiques, apparaît comme une mesure clé pour faciliter leur importation et leur diffusion. Parallèlement, un investissement accru dans les énergies renouvelables s'avère nécessaire afin d'élargir l'accès à des sources d'énergie durables et accessibles à un plus grand nombre. Le développement des infrastructures énergétiques doit également être renforcé pour garantir une distribution efficace de l'énergie sur l'ensemble du territoire, notamment dans les zones rurales qui restent les plus affectées par la pauvreté énergétique. En outre, la mobilisation de financements, à travers des partenariats entre les secteurs public et privé, est essentielle pour soutenir le développement du secteur énergétique et accélérer la transition vers des solutions énergétiques modernes. Dans ce cadre, l'Accord de libre-échange continental africain (AfCFTA) constitue une opportunité stratégique permettant de favoriser le commerce intra-africain des technologies énergétiques

et de stimuler la transition énergétique à l'échelle du continent. Ces résultats soulignent l'importance d'une approche intégrée qui associe libéralisation commerciale, développement des infrastructures et promotion des énergies renouvelables afin de lutter efficacement contre la pauvreté énergétique en Afrique subsaharienne.

Conclusion

L'Agenda 2030 des Objectifs de Développement Durable (ODD) représente une feuille de route essentielle pour le développement de l'Afrique subsaharienne, en abordant les défis économiques, sociaux et environnementaux tout en promouvant une croissance inclusive et durable. Les pays de la région se sont engagés à réaliser ces objectifs, notamment en matière de réduction de la pauvreté, de sécurité alimentaire, d'égalité des sexes, d'accès à l'énergie propre et de renforcement des infrastructures. Toutefois, atteindre ces objectifs ne constitue pas seulement une ambition, mais une nécessité impérieuse face aux défis structurels profonds de la région, marqués par la pauvreté, les inégalités et la vulnérabilité aux crises climatiques et économiques.

L'intégration des stratégies de développement nationales aux ODD peut permettre aux pays de mobiliser des investissements dans des secteurs stratégiques tels que les énergies renouvelables et l'agriculture durable. De plus, le renforcement du commerce et de l'intégration régionale peut contribuer à l'émergence d'opportunités de marché et à l'amélioration de la compétitivité de l'Afrique subsaharienne dans l'économie mondiale. Dans ce contexte, la libéralisation commerciale apparaît comme un moteur clé de la croissance inclusive et durable, en favorisant la diversification économique, la hausse de la productivité, la création d'emplois et l'attraction des investissements étrangers.

L'objectif de cette thèse était d'analyser empiriquement l'impact de la libéralisation commerciale sur plusieurs ODD particulièrement pertinents pour l'Afrique subsaharienne. Trois dimensions majeures ont été examinées : le chômage, la sécurité alimentaire et la pauvreté énergétique.

Dans le premier essai, l'impact de la libéralisation commerciale sur le chômage a été analysé à l'aide de la méthode des moments généralisés (GMM), permettant d'éviter les problèmes d'endogénéité. Les résultats indiquent un effet significatif et négatif du commerce sur le chômage au cours de la période 2000-2019. En distinguant les taux de chômage selon le genre, il apparaît que l'ouverture commerciale réduit davantage le chômage féminin que masculin, ce qui souligne la nécessité de politiques spécifiques pour renforcer l'insertion des femmes sur le marché du travail. L'analyse du chômage des jeunes révèle également une réduction significative en lien avec la libéralisation commerciale. Ces résultats suggèrent que l'ouverture commerciale constitue un levier important pour la création d'emplois en Afrique subsaharienne. D'un point de vue

politique, il apparaît essentiel de poursuivre les efforts de libéralisation des échanges à travers la réduction des barrières tarifaires et non tarifaires, tout en soutenant les industries tournées vers l'exportation. En parallèle, l'investissement dans les infrastructures et la promotion de politiques d'égalité des sexes doivent être renforcés afin de maximiser les bénéfices de la libéralisation commerciale sur l'emploi.

Dans le deuxième essai, l'effet de l'ouverture des importations céréalières sur la sécurité alimentaire a été évalué à l'aide d'un modèle à variables instrumentales (2SLS-IV). Les résultats montrent que l'augmentation des importations de céréales a un impact négatif sur la sécurité alimentaire, en augmentant la prévalence de la sous-alimentation. Ces conclusions sont cohérentes avec la littérature existante qui souligne la vulnérabilité des pays fortement dépendants des importations alimentaires face aux fluctuations des marchés internationaux. En conséquence, les politiques agricoles devraient privilégier un équilibre entre les importations et la production locale afin de limiter cette dépendance. Des mesures incitatives visant à stimuler la production céréalière domestique et à améliorer l'accès des petits producteurs aux marchés sont essentielles. En outre, il est crucial de négocier des accords commerciaux favorisant un approvisionnement stable et abordable en céréales, tout en investissant dans la modernisation des infrastructures agricoles pour accroître la productivité locale.

Le troisième essai s'est penché sur la relation entre la libéralisation commerciale et la pauvreté énergétique, en mesurant l'impact des réductions tarifaires sur l'accès aux combustibles propres et aux technologies modernes de cuisson. L'analyse empirique, basée sur des modèles économétriques de long terme (DOLS, FMOLS, CCR), révèle une relation négative et significative entre la réduction des tarifs douaniers et la pauvreté énergétique. Ces résultats corroborent les théories du commerce international, notamment le modèle de Heckscher-Ohlin, qui prédit qu'une baisse des droits de douane favorise l'accessibilité des technologies modernes. L'étude met également en évidence le rôle positif de la croissance économique, de la consommation d'énergies renouvelables et de l'urbanisation dans la réduction de la pauvreté énergétique. Ces conclusions appellent à la mise en place de politiques favorisant la réduction des tarifs sur les équipements énergétiques modernes, la promotion des investissements dans les énergies renouvelables et l'amélioration des infrastructures énergétiques pour garantir un accès équitable à l'énergie propre. L'Accord de libre-échange continental africain (AfCFTA) représente une opportunité stratégique pour encourager le commerce intra-africain des technologies énergétiques et accélérer la transition énergétique. Les analyses empiriques menées dans ces trois essais mettent en évidence l'importance de la libéralisation commerciale dans l'amélioration des conditions socio-économiques en Afrique subsaharienne. Cependant, il est essentiel d'accompagner cette libéralisation par des politiques complémentaires adaptées à chaque secteur

afin d'en maximiser les bénéfices. L'agriculture est apparue comme un facteur déterminant pour la sécurité alimentaire, ce qui implique la nécessité de renforcer les investissements dans la productivité agricole, l'adoption de technologies modernes et l'amélioration des infrastructures de stockage et de transport. Par ailleurs, la qualité des institutions joue un rôle central dans la lutte contre la pauvreté énergétique. Un cadre réglementaire stable, une gouvernance efficace et des incitations à l'investissement privé sont des éléments clés pour garantir un accès élargi à l'énergie propre.

En termes de perspectives de recherche, plusieurs dimensions mériteraient d'être approfondies. Dans le premier essai, l'analyse du chômage ne prend pas en compte l'adéquation des compétences sur le marché du travail ni la qualité des emplois créés par la libéralisation commerciale. L'impact des changements structurels dans les industries et les effets sur le travail informel constituent également des axes de recherche intéressants. Le deuxième essai pourrait être complété par une analyse de l'impact du commerce sur la nutrition et la diversité alimentaire, en tenant compte des effets de la libéralisation sur les habitudes de consommation et les apports nutritionnels. Enfin, le troisième essai pourrait explorer davantage le rôle de l'innovation technologique et des investissements en recherche et développement dans la transition énergétique des pays d'Afrique subsaharienne.

En conclusion, cette thèse met en évidence que la libéralisation commerciale peut constituer un levier puissant pour favoriser la croissance économique, réduire le chômage, améliorer la sécurité alimentaire et atténuer la pauvreté énergétique en Afrique subsaharienne. Toutefois, pour que ses bénéfices soient pleinement exploités, elle doit être accompagnée de politiques publiques adaptées visant à renforcer les capacités productives locales, améliorer les infrastructures et assurer une transition énergétique durable.

Windbeneti Arnaud Zahonogo

Évaluer l'impact de la libéralisation du commerce sur le chômage, la sécurité alimentaire et la pauvreté énergétique en Afrique Subsaharienne: Une approche en trois essais

Résumé :

Cette thèse vise à contribuer à la littérature existante sur les liens entre la libéralisation du commerce et les questions socio-économiques en Afrique Subsaharienne, avec un accent particulier sur les Objectifs de développement durable (ODD) relatifs au chômage, à la sécurité alimentaire et à la pauvreté énergétique. L'essai 1 analyse l'impact de la libéralisation du commerce sur le chômage. Nous constatons que la libéralisation du commerce contribue à réduire le chômage. Dans l'essai 2, nous évaluons l'impact de l'ouverture des importations de céréales sur la prévalence de la sous-alimentation en Afrique subsaharienne. Nous montrons que les importations de céréales augmentent l'insécurité alimentaire dans la région. L'essai 3 aborde la question de la pauvreté énergétique. Nous montrons qu'une réduction des droits de douane est associée à une augmentation de l'accès aux combustibles propres, ce qui contribue à réduire la pauvreté énergétique.

Mots clés: Libéralisation du commerce, Chômage, Sécurité alimentaire, Pauvreté énergétique, Afrique Subsaharienne, Objectifs de développement durable.

Assessing the Impact of Trade Liberalization on Unemployment, Food Security, and Energy Poverty in Sub-Saharan Africa: A Three-Essay Approach

Abstract :

This thesis aims to contribute to the existing literature on the links between trade liberalization and socio-economic issues in Sub-Saharan Africa, with a particular focus on the Sustainable Development Goals (SDGs) targets of unemployment, food security and energy poverty. Essay 1 analyses the impact of trade liberalization on unemployment. We find that trade liberalization contributes to reducing unemployment. In essay 2, we assess the impact of cereal import openness on the prevalence of undernourishment in SSA. We show that cereal imports increase food insecurity in the region. Essay 3 addresses the issue of energy poverty. We show that a reduction in tariff rates is associated with an increase in access to clean fuels, which helps to alleviate energy poverty.

Keywords: Trade liberalization, Unemployment, Food security, Energy poverty, Sub-Saharan Africa, Sustainable Development Goals.

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