

UNIVERSITY OF GHANA

COLLEGE OF HUMANITIES



**THE IMPACT OF INNOVATION ON JOB CREATION IN GHANA. IS THERE A GENDER
DIMENSION?**

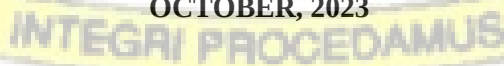
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**THIS THESIS/ DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON
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ECONOMICS DEGREE**

DEPARTMENT OF ECONOMICS

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DECLARATION

I, Peter Mbamon Wadam, hereby declare that apart from the references made to other research works I have duly acknowledged, this thesis was carried out by me under Dr. Priscilla Twumasi Baffour and Dr. Emmanuel Nii Abbey.

I bear sole responsibility for any shortcomings.



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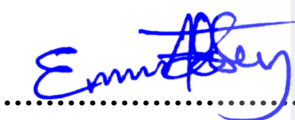
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ABSTRACT

Using a panel dataset of 421 Ghanaian industrial and service enterprises from 2013 to 2015, this study empirically ascertains the effects of innovation on labour demand at the firm level. Due to reversal effects, the total impact of innovation on employment is unclear in theoretical contributions. Some are of the view that innovation has a possibility of destroying jobs due to its immediate direct labour-saving nature. Others argue that several compensating mechanisms cancel out the primary effect of innovation, leaving the subsequent effect unclear (Twumasi Baffour et al. 2019). Innovation is thought to substantially affect job creation in either case. Additionally, the link between gender and the innovative behaviour of organizations has received more attention from researchers and policymakers in recent years, although the empirical results are still not definitive. There is a wealth of literature on the subject of how impactful innovation has been on job creation. This study will add to this body of literature by considering whether or not there is a gender dimension to it.

A panel fixed effect model is used to explore how innovation in product and process influences employment at the firm level. The Hausman-Taylor estimator with the random effect model is also used as a robustness check as a majority of the significant variables are time-invariant and there is a suspicion of endogeneity. The probit regression model is employed to determine whether the gender of firm ownership has any bearing on the creative behaviour of the firm. The Fixed effect first difference regression model for Change in employment is used to determine whether additional jobs were created over the years under consideration.

The results indicate that innovation in product and process has no significant impact on the creation of new jobs. Other outcomes demonstrate that product innovation affects employment significantly. As opposed to that, the link between process innovation and employment level is not

immediately apparent. Additionally, male-owned manufacturing firms that engage in innovation positively and significantly impact employment levels. However, there is an inverse relationship between employment levels and female-owned product innovative firms. For small, medium, and large businesses, process innovation in large businesses owned by males had a positive impact on employment levels, whereas, in large businesses owned by women, there is an inverse correlation between process innovation and demand for labour. Due to the gender-neutral nature of innovation in Ghanaian manufacturing and service businesses, the findings of the probit regression model indicated that gender had no statistically significant impact on firms' innovative behaviour.



DEDICATION

This thesis is devoted to God, my family, and all organizations and individuals fighting to ensure women have the opportunity to contribute to economic development.



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Most importantly, I give God the glory for making this possible.

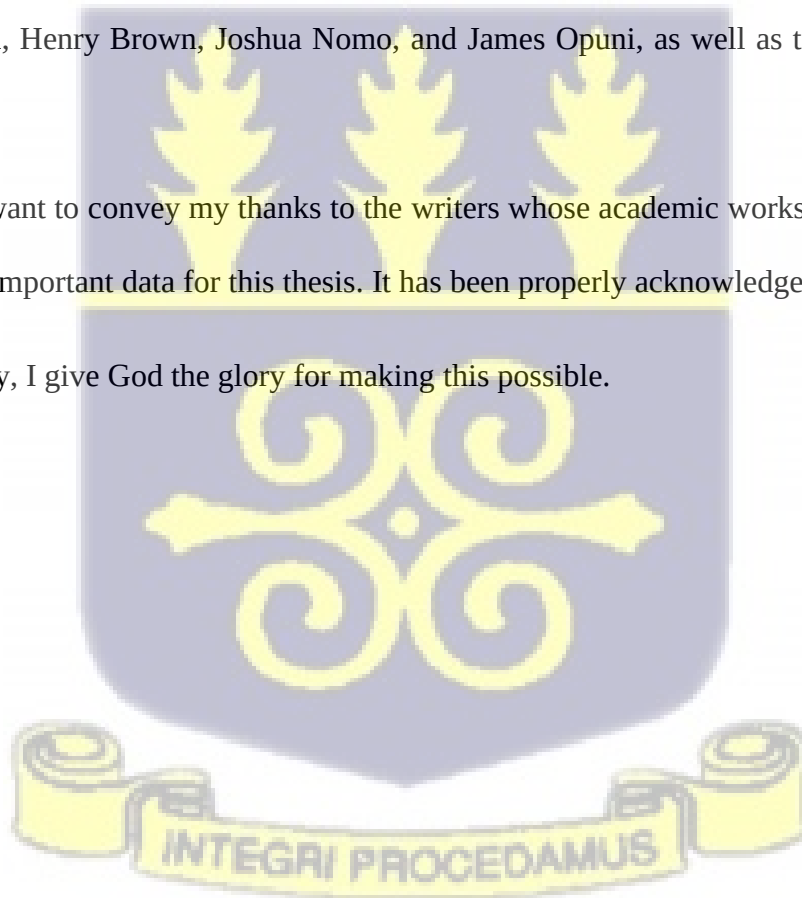


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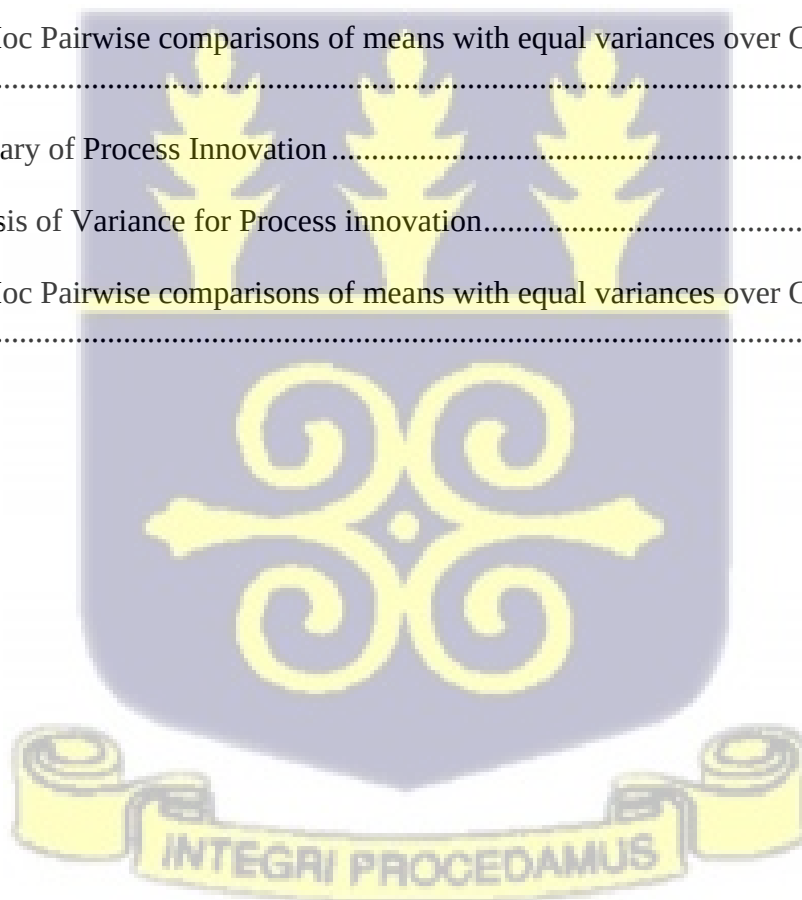
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LIST OF ABBREVIATIONS

AU	African Union
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AFJ	Aquaculture for Food and Jobs
CAP	Coronavirus Alleviation Programme
CAP-BuSS	Coronavirus Alleviation Programme Business Support Scheme.
CEDAW	Convention on Elimination of All forms of Discrimination Against Women
DMBs	Deposit Money Bank
ECOWAS	Economic Community of West African States
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GIRC	Ghana Innovation and Research Commercialization
GEA	Ghana Enterprise Agency
GLSS	Ghana Living Standards survey
HCI	Human Capital Index
IFC	International Finance Corporation
ILO	International Labour Organization
ICT	Information and Communication Technology
IBES	Integrated Business Establishment Survey
MDAs	Ministries Department and Agencies
MEST	Ministry of Environment, Science and Technology
MESTI	Ministry of Environment, Science, Technology and Innovation
MMDAs	Metropolitan, Municipal and District Assemblies
MMSE	Micro and Small-Scale Enterprises
MNE	Multi-National Affiliates
MSME	Micro, Small and Medium Enterprises

MSML	Micro, Small, Medium and Large
MOWAC	Ministry of Women and Children Affairs
NBSSI	National Board for Small-Scale Industries
NEIP	National Entrepreneurship and Innovation programme
NITA	National Information Technology Agency
SBIR	Small Business Innovation Research
SME	Small and Medium-Scale Enterprises
STI	Science Technology and innovation
SSA	Sub-Saharan Africa
S&T	Science and Technology
TVET	Technical and Vocational Education and Training
YLSTI	Youth Leadership and Skills Training Institute



CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Literature on economic development has acknowledged the relevance of innovation as the catalyst of economic growth, competitiveness, and a key means of generating good jobs; as a result, most nations are increasing the innovation capacities of their enterprises (Avenyo & Kraemer-Mbula, 2019).

According to the UN World Population Prospects (2019), the population of Africa as of July 2021 was predicted to be approximately 1.37 billion, the second highest after Asia necessitating the initiation and implementation of policies that are aimed at creating jobs. An example of such policies is the initiative that was taken by the African Union (AU) through the AU Agenda 2063. Together, the Science, Technology, and Innovation strategy for Africa 2024 (STISA-2024) and the AU Agender 2026 both emphasize innovation and “people-centred” development as the main catalyst of Africa’s Socio-Economic development- both in the short and long run (Avenyo & Kraemer-Mbula, 2019).

Innovation refers to coming out with something new such as an invention or developing and introducing new things. In the technological world, innovation is usually in the form of a new product or a new method of production. There are therefore different kinds of innovation which include technological innovation, service innovation, organizational innovation, logistical innovation, product innovation, and process innovation among others. The focus of this study will be on technological innovation with an emphasis on process and product innovation and how that affects job creation at the firm level.

Job creation is the process of creating new jobs, particularly for those who have been unproductive or without jobs in previous years.

Technological innovation according to Stoneman, (1983) is the improvement of procedures and goods via the creation or use of novel technologies to enhance efficiency and outcomes. Stoneman, (1983) also defines process innovation as an instance where a business applies fresh or enhanced production or processing methods while Product Innovation pertains to the development and introduction of new or enhanced goods

According to Harrison et al. (2005), the effect of innovation on employment is of interest but the relationship that exists between them remains complex. The study indicated that, in the long run, the macroeconomic effect of innovation on labour demand is not negative because countries that have embarked on innovation for many decades and even centuries have not experienced decreasing levels of employment. However, there is not enough theoretical clarity concerning how innovation affects employment creation at the firm level. The study stated that there are numerous reasons why the relationship between innovation and job creation at the firm level is important. For instance, innovation's effect on job creation at the firm level will determine how diverse agents within the firm react to innovation. Furthermore, the motivation of managers and employees determines the innovation adopted and its impact on output, pricing, and employment. A good understanding of these incentives at the micro level can be an effective guide in designing innovative employment policies.

Neoclassical economists' postulate that unemployment is voluntary since the labour market clears at the equilibrium wage rate hence whoever wants to find a job can get one at the prevailing wage rate. An example of this voluntary unemployment is structural unemployment where there is a mismatch between labour demand and the services job seekers can offer. The services that job

seekers can offer do not correspond with the skill set that is demanded by employers. The Keynesians, on the other hand, believe that unemployment is not voluntary but only occurs as a result of an excess supply of labour over demand. In essence, the jobs that are available in the labour market are few for the number of people looking for jobs hence some job seekers are unable to find jobs due to a lack of employment opportunities. Therefore, necessary steps must be taken toward job creation because employment remains a relevant indicator of economic growth (Vinci, 2017; Twumasi Baffour et al. 2018).

The level of unemployment in Africa is alarming as indicated by International Labour Organization, (2020) that in 2019, close to 34 million people in Africa were unemployed, of which 12.2 million were between the ages of 15 to 24. This unemployment rate of 6.8% was higher than the world average of 5% indicating that unemployment remains one of the major political and socio-economic challenges in Africa regardless of the progress made by many African countries in terms of growth. According to Baah-Boateng (2016), studies have shown that growth within the African continent has been remarkable over the last decade. The research stated that on average, SSA grew more than 4.5% annually between 2000 and 2012. This is above the 2% growth that was experienced twenty years before that. As a result, so many jobs were created but were insufficient to meet the growing population of young people searching for jobs. Between the years 2000 and 2008, the African continent was able to create a total of about 73 million jobs, but out of this, only 16 million which represents 21.9% benefited the youth leaving most of them either still unemployed or in many jobs that offer very low remuneration. The study further indicated that, in as much as youth unemployment is a global issue, it is more alarming in Africa due to the youthful nature of the African population. The population of Africa is very youthful with more than half under 25 years old. It is projected that between the period 2015 and 2030, there will be a year-by-

year annual increase of 0.5 million in the number of 15year old's that will join the labour market. As the youth population within the African continent is growing, they are also becoming better educated. The proportion of youths aged 20 to 24 having high school education is expected to reach 59% by 2030. These youth can also be a source of civil unrest if care is not taken. Against this background, it has become necessary for African countries to begin to look at ways of creating jobs in the wake of high levels of unemployment.

Technology especially at the firm level can contribute to job creation which can help curb the menace of unemployment (Gagliardi et al. 2016; Grimalda, 2016). Twumasi Baffour et al. (2018) noted that innovation at the firm level has become essential and current on the agenda of many countries since countries with a high level of technology record high levels of growth compared to their counterparts with low levels of technology. In literature, firm-level innovation is known to always have an immediate effect on demand for labour (Garcia et al. 2004), but the direction of this impact remains inconclusive. Some are of the view that innovation can hurt jobs due to its immediate direct labour-saving nature (Vivarelli, 2005), while others posit that several compensation mechanisms cancel out the innovation's immediate impact rendering the outcome indeterminate (Vivarelli, 1995). The outcome of innovation at the firm level may also depend on factors such as market organization, institutional framework, and type of innovation introduced. Although the relationship between innovation and employment creation is not obvious, data shows that innovative businesses have a better chance of survival compared to non-innovative businesses (Garcia et al. 2004; Harrison et al. 2014).

Twumasi Baffour et al. (2018) indicated that Ghana is lagging in technological advancement among many African countries. Since independence, the technology gap has widened because Ghana has maintained its conventional exports while most non-African nations have

industrialized. The inability of the country to upgrade its production process and organizational structure explains why Ghana is still focused on traditional export. The study maintains that countries that have become very competitive globally have invested in technology.

According to the Ministry of Environment Science and Technology (2010), Ghana always had the vision of advancing technologically since independence, but there was no clear policy to fuel the vision. The dream of building a robust economy that will thrive through the advancement in science and technology was halted after the first nationalist government was toppled. The sector ministry that was intended to control the nation's science and technology policy agenda kept changing, making it difficult for the governments that followed to maintain this dream.

In her quest to attain middle-income status, Ghana came out with her maiden National Science, Technology, and Innovation Policy in the second half of 2010 (Ministry of Environment Science and Technology, February, 2010). This strategy was developed to help the nation advance toward accomplishing national goals including lowering the rate of poverty, raising productivity and competitiveness, and fostering environmentally sustainable business practices and industrial growth. In terms of innovation, the policy aimed to facilitate the development of science and technology infrastructure for R&D and innovation. The Ghana Shared Growth Agenda (2010), in a similar context, also prioritizes fostering technological transfer through the incorporation of foreign direct investment (FDI).

The notion that innovation is biased against women has persisted for a long time. The general perception of innovation when it comes to men and women is that women are less innovative (Nählinder, 2010). When we closely examine the available evidence, this is not accurate. After conducting an enterprise survey of 75 developing countries, the world bank reported that, between 2007 and 2014, 19.86% of female-owned firms introduce new products into the market (World

bank, 2015). With less than 8% of all firms being led by women, there are variances in the number of women-driven businesses in nations including Argentina, Bangladesh, Georgia, Mexico, India, Turkey, Senegal, Tajikistan, Tanzania, and Uzbekistan. Less than 4% of all businesses are run by women in Afghanistan, Armenia, Bolivia, Cameroon, Egypt, and Yemen, compared to at least 25% in other developing nations like Estonia, Latvia, Romania, Serbia, Mongolia, and Ukraine (World Bank, 2015).

The focus on innovation and job creation in female-owned businesses has increased in recent years. Belitski and Desai (2019) discovered a variation between male and female Chief Executive Officers (CEO) in terms of innovation and job creation. Due to the apparent bias against women, research has also shown a financing disparity between men and women entrepreneurs (Jennings & Brush, 2013). According to Coad (2011), evidence shows that enterprises that are owned by females in developing countries experience low growth rates compared with male-owned enterprises. The reason is that there is often a conservative social attitude concerning women in the industry. Coad (2011) further stated that when it comes to ambition, female entrepreneurs are less ambitious compared to their male counterparts in the industry which can affect their innovative behaviour. They are more concerned about providing for their families than achieving high-growth performances. The study indicated that enterprises that are owned by females are often smaller and pay very less to their employees hence on average, female firms are less likely to promote any form of innovation in their enterprises compared with their male counterparts.

From a global perspective, women play a central role in the socioeconomic advancement of countries. More specifically, women's participation in economic activities is seen to be a very important avenue for innovation and job creation (Kimosop, 2016). Avenyo and Kraemer-Mbula (2019) are of the view that there is a need to promote technological innovation in female-owned

firms because technological abilities have a significant effect on female-owned firms' performance. World economic statistics of newly founded businesses in 74 countries in 2016 indicated that approximately 16 million new enterprises were managed by women while about 101 million already-existing businesses were run by women (International Labour Organization (ILO),2018). The progress made in closing the gender gap and achieving gender uniformity has slowed down in recent times, despite the enormous contributions that women make to the world economy as well as the realization that utilizing and assimilating the concepts, abilities, and capabilities of women helps address global issues (Avenyo & Kraemer-Mbula, 2019). The gender disparity was discovered to have widened in the “economic participation” of females from that of males in 2016 and 2017 (World Economic Forum, 2017).

In Africa, due to the importance of the informal sector, the economic participation of women is seen to be very high. About 92.4% of African economic units are informal, accounting for the largest share of employment (International Labour Organization (ILO) 2018). Globally, the proportion of men that are employed in the informal sector is far larger than that of females but within Sub-Saharan Africa, (SSA) females dominate the informal sector. Reports from the International Labour Organization (ILO) (2018) indicate that, in SSA, women make up 82.8% of non-agriculture informal employment while men make up 71.6% and most of these women are primarily employed in Micro and Small-Scale Enterprises (MMSE) (Otobe, 2017).

1.2 Problem Statement

There is a wealth of literature on gender and innovation, specifically in management and entrepreneurship (Avenyo & Kraemer-Mbula, 2019), yet very little is done in attempting to understand the effects of gender on innovation and by extension employment at the firm level. The participation of women in the economic development of countries cannot be overlooked. Kimosop

(2016) indicated that women's involvement in economic activities is considered a very important avenue for innovation and job creation. Ranga, (2010) indicated that women engage in innovation activities but the research on innovation has failed to consider and account for female innovative activities. Ranga, (2010) further stated that the literature on innovation is also criticized to be male-biased because the focus has always been on innovations that are carried out by male-dominated industries but evidence suggests that female-owned firms have introduced innovations which are directed at addressing issues of economic growth and development (Lindberg, 2011). Foss et al. 2013 also discovered that women are as innovative as men in coming out with new ideas but because they are not viewed as innovators, these ideas do not usually get to the execution stage.

Women's participation in economic activities in Ghana is diverse, spanning from the formal to the informal sector even though majority are in the informal sector. Women's participation in the formal sector has increased over the years as a result of the improvement in their education. Nonetheless, these women still face challenges in contributing to and benefiting from economic development. In Ghana, there is a lack of empirical studies on the role of gender in private enterprise innovation as well as gender and innovation in an entrepreneurial setting. Furthermore, there is little study on gender perspectives on development policy, innovation systems, and innovation support schemes.

It is therefore important to probe into the link between gender, innovation at the firm level and employment with emphasis on female-owned firms because women are very good innovators, especially in management and institutional context. This will aid in determining women's contributions to economic growth, which will serve as a guide for the implementation of policies to help strengthen female firms and raise their contribution to economic development through job creation.

1.3 Research Objectives and Questions

Objectives:

The goal of the study is to examine how innovation affects the creation of new jobs in Ghana, with an emphasis on the gender dimension. To address this, the study will determine:

1. Effect of innovation on job creation in Ghanaian service and manufacturing enterprises.
2. Explore the role of gender of firm ownership on the innovative behaviour of firms in Ghana
3. Impact of innovation on job creation of male vs. female-owned firms-a comparative analysis.

Questions:

The following are the questions that the research will address:

1. To what extent does the level of innovation of a firm influence its levels of employment?
2. Is gender a significant factor in the decision to innovate in Ghanaian firms?
3. Is the relationship between innovation and employment different from men and women-owned enterprises?

1.4 Relevance of the Study

There are diverse opinions regarding the kind of relationship that exists between innovation and employment. While some are of the view that innovation creates employment (Reenen, 1997; Vivarelli, 2005), others also posit that innovation destroys jobs. Harrison et al. (2008) for instance using firm-level data from four European countries concluded that process innovation displaces workers whereas product innovation is labour friendly

In the case of Ghana, Twumasi Baffour et al. (2018) used firm-level panel data between 2013 and 2015 and found that product innovation has a positive impact on employment. On the other hand, process innovation does not significantly impact employment in Ghanaian manufacturing and service firms.

I will like to contribute to the literature on innovation and job creation in Ghana, considering the gender dimension. Kveine (2011) argues that looking at innovation through the gender lens could serve as a guide that can help create innovative activities that can meet pertinent societal challenges such as global warming and other sustainable development goals. Having a very good understanding of the role gender plays in innovation will help solve the gender neutrality problem in innovation and also help understand if there are any differences in terms of the innovative behaviour of male-owned and female-owned firms in Ghana. Does the informal atmosphere in Ghana have any influence on the innovative behaviour of female-owned firms? Most of the evidence available, which is mainly on the formal enterprises, that have examined the link between gender and innovation are having results that are not very conclusive as to whether female own firms either do better and/or otherwise than male-owned firms with evidence remaining very scanty for developing countries (Avenyo & Kraemer-Mbula, 2019). The lack of empirical evidence regarding the effect gender has on innovation has limited our understanding of this relationship. Hence the gender perspective where the emphasis is placed on people thus men and women involved in innovative activities in Ghana are very important for innovation and development.

This study will add to the pool of knowledge regarding the relationship that exists between innovation, gender and job creation at the firm level in Ghana with clarity on whether the gender of firm owners plays any role in their innovative behaviour.

1.5 Organization of Study

This research is divided into six chapters. The second chapter after this first chapter provides an overview of Ghana's innovation, employment, and unemployment patterns as well as the level of female participation in business. The third chapter examines the theoretical and empirical literature on the influence of innovation on employment creation, as well as the gender dimension. In chapter four, the data and techniques used to measure the effect of innovation on employment creation in Ghana are discussed. The fifth chapter reports on and examines the study's findings. The sixth and last chapter presents the conclusion with a summary of the findings and policy recommendation



CHAPTER TWO

INNOVATION, EMPLOYMENT, UNEMPLOYMENT AND WOMEN'S BUSINESS PARTICIPATION IN GHANA

2.1 Introduction

Every nation's capacity to generate long-term employment, reduce unemployment rates, and prioritize technological advancement all contribute to its economic success. The failure of most African countries, including Ghana, to generate enough jobs to accommodate their rapidly expanding populations and the dated technology employed in the various sectors of the economy, is currently one of their biggest economic issues. Despite progress made in reducing the problem, low levels of technical development and unemployment continue to be serious problems for Ghana and most African countries.

In recent times, the status of women in society has generated a lot of discussions, especially their involvement in economic growth, with one aspect of the argument opposing increasing female participation in all sectors of the economy and society based on cultural and biological factors, yet, the opposing view asserts that a woman's status in society relies on her engagement in social and economic endeavours. Fortunately, women have achieved tremendous progress in every sector of the economy of Ghana, particularly in the sectors of agriculture and services even though women's duties and participation in economic activity have been characterized and constructed in terms of biology and culture.

The purpose of this chapter is to examine the nature of employment and unemployment in Ghana as well as the technical advancement of the country. The extent to which women have been able to fully engage in the country's core economic activities and the problems they confront will also be discussed.

2.2 Background

The overall GDP growth rate of Ghana reduced to 0.4% in 2020 from 6.5% in 2019. This performance falls below the Mid-year target of 0.9% (Annual Progress Report, 2020). The agriculture, service, and industry sectors contributed 7.4%, 1.5%, and -3.6% to GDP respectively in 2020 compared with 4.6%, 7.6%, and 6.4% in 2019 as stated in the 2020 Annual progress report. Except for the agriculture sector, the service and industry sectors contributed more to GDP in 2019 than in 2020 demonstrating the effects of the Covid-19 pandemic. The country also recorded an unemployment rate of 7.8% in 2021 (Ghana statistical service, 2021). The economic downturn has had an impact on households resulting in a slight increase in the poverty rate from 25% in 2019 to 25.5% in 2020 (World Bank, 2021). This, therefore, calls for measures that will help change the narrative of the country from an underperforming economy to one that is booming in all sectors, and innovation at the firm level can help change that narrative. According to the latest Country Economic Memorandum Report of the world bank in 2022, the Ghanaian economy is dominated by Micro, Small, and Medium Enterprises (MSMEs) that are unable to grow. The report indicated that in 2015, 98% of the businesses in the country were micro or small and 90% were informal. MSMEs account for 83% of persons engaged in business. Pierre Laporte, who was appointed world bank Director for Ghana, Liberia, and Sierra Leone effective July 1, 2019, till date, opined that “Digital technologies could offer a source of productivity growth and accelerate firm upgrading and spur innovation and entrepreneurship, driving the growth of higher quality jobs in Ghana.” “MSMEs also provide important job opportunities for women and young people, meaning that addressing their challenges is a major way to improve inclusion”

For digital transformation to become the main driver of firm upgrading and job creation, World Bank (2021) recommended that Ghana focuses on the incorporation of “industry 3.0” technologies.

This includes internet service, mobile and computing devices, and smartphones, especially in micro-enterprises and industrial enterprises. It will make it easier and set the right basis for the introduction of a more advance “industry 4.0” technology including large-scale data collection, analytics, and artificial intelligence (AI), automation Software and internet banking methods. They highlighted the following as some of the pillars that can accelerate economic transformation for better jobs:

- To stimulate entrepreneurship, the Ghanaian economy would need to foster high-tech change through the use of digital and related technologies in local enterprises.
- To encourage more sustainable growth within the private sector, Ghana will need to persuade the financial sector to support and enhance business growth, incorporating technology, and invention by facilitating long-term financing, hastening the establishment of the new wholesale financial institution, enhancing the capital market, lowering collateral requirements, and minimizing the risk of default for banking institutions.

The World Bank Group, (2021) report on Accelerating Economic Transformation and Creating Jobs identified acute job shortage as one of the major challenges of the Ghanaian economy and to overcome this challenge, the country needs to work hard towards the creation of more jobs to meet the fast-growing population. According to the report, the country has several strong service sub-sectors that hire very few people, as well as a manufacturing industry with low performance, therefore majority of job opportunities are in low-performing sectors, mostly informal service sectors. Over 70% of occupations in Ghana are thought to be in the informal sector, while approximately 65% of formal jobs are considered to be insecure employment, according to the report. By 2040, it is expected that the country would have a population of over 45 million, with

58% of people under the age of 30. This means that between now and 2040, about ten million Ghanaians will be in the labour force.

2.3 Technological Upgrading in Ghana

As stated in the preceding chapter, Ghana has not been very competitive in the global market due to the country's insufficient technological expertise and failure to upgrade its manufacturing process and organizational structure. The East Asian example demonstrates that good technical policies can boost a country's enterprises while also increasing its competitiveness (Gyeke-Dako et al. 2016).

According to the Ministry of Environment Science and Technology (2010), Ghana came out with its first comprehensive policy on innovation in the second half of 2010. This policy was adopted to reduce poverty, enhance the competitiveness of enterprises, help sustain environmental management, and boost industrial growth among others. But in the area of innovation, the policy specifically attempts to foster the development of the infrastructure for innovation and research in science and technology.

In 2017, the Ministry of Environment, Science, Technology and Innovation revised the innovation policy capturing it as National Science, Technology and Innovation Policy (2017-2020). Generally speaking, the goal of the policy was to offer a framework for fostering innovation in business and society. The Ministry of Environment, Science, Technology, and Innovation (MESTI) has the responsibility to encourage the use of science and technology in the nation and to foster an environment that is conducive to innovation. By this objective, MESTI offers this policy statement as the cornerstone of its initiatives. The policy document has in its sector-specific objectives. In the area of the country's industrial development, there are a lot of initiatives targeted at boosting

the development of local firms because most of these local firms are informal and characterized by obsolescent and local technologies, hence making significant improvements in science, technology and innovation, can help the industrial sector increase their scale of production and processing to create jobs. About the industrial sector, the country's National Science, Technology and innovation policy (2017-2020) seeks to:

- “Strengthening systems and mechanisms for acquisition, assessment, adaptation, adoption and application of essential technologies for industrial activities;
- Encouraging R&D activities that develop tools, equipment and machinery for industries;
- Encouraging quality assurance in manufacturing;
- Promoting S&T activities that would accelerate technology transfer and innovations;
- Creating incentives to promote investment and support in research and development by the private sector;
- Facilitating capacity building in engineering design and manufacturing technology to enhance national development;
- Enhancing industrial technology development infrastructure;
- Promoting and facilitating recyclable materials technologies, and applications to minimize industrial waste in the environment;
- Promoting scientific knowledge acquisition and development of technologies in the new and emerging disciplines of biotechnology, materials science, micro-electronic and laser technology;
- Creating the national capacity to exploit opportunities for innovation in addressing climate change;

- Establishing industrial parks, innovation centres and business incubators to foster linkages between the knowledge centres (i.e., research institutes and universities) and productive enterprises;
- Institutionalizing regular interaction between research institutions/universities and the private sector;
- Incentivizing firms to support industrial attachment programmes for S&T students.”

Also, in the area of youth innovation, the policy seeks to:

- “Promote innovation at all levels of the educational system;
- Encourage activities that draw on the STI capabilities of the youth such as Science and Mathematics clinics, and computer programming clinics for both girls and boys, and promote STI competition among the youth;
- Establish award schemes that reward innovation among the youth;
- Provide scholarships for promising science students;
- Establish mechanisms for encouraging young people to study the sciences;
- Initiate mechanisms for the early identification of talented young scientists; and
- Establish mentoring programmes in STI for the youth.”

And in the area of Information Communication and Technology, the policy seeks to:

- “Ensure STI capabilities exist to integrate ICT into all sectors of the economy including education, industry, agriculture, health and e-governance;
- Develop a national competence for computer hardware and software engineering and information security;

- Facilitate the development of a modern ICT infrastructure to improve teaching, learning and research
- Disseminate and pursue ICT for development (ICT4D) principles and ideals.”

Even though there are no explicit policies on either process or product innovations, other government initiatives will benefit firms directly and indirectly. The Ghana Innovation and Research Commercialization (GIRC) Center was established to close the gap between research outputs and their application for innovation and development, according to the National Medium-Term Development Policy Framework (2022–2025). This was done to support the government's plans of enhancing R&D activities for industrial development. Additionally, the government provided 14 businesses with GH 227.2 million and helped 763 MSMEs obtain credit facilities in 2020. Based on the policy statement, loans from Deposit Money Banks (DMBs) to manufacturing improved from 8.6% in 2017 to 10% in 2018. To provide loans to MSMEs in 2019, the government worked with Ghana Enterprise Agency (formerly NBSSI). Despite making up 55.9% of beneficiaries, females only received 45.9% of the total loan amount. Additionally, the agency offered MSMEs a range of business development services to support their expansion and operational effectiveness. Approximately 61.2% of those who benefited from the services—which included training, advice, and counselling extension services—were women. In May 2020, the government launched the Coronavirus Alleviation Programme Business Support Scheme (CAP-BuSS) with a budget of GH600.0 million to assist MSMEs especially. The Scheme is a component of the GH1.2 billion CAP authorized by Parliament to deal with the COVID-19 pandemic-related interruption to economic operations. Ghana Enterprises Agency (GEA) developed a soft credit programme with a one-year deferral and a two-year amortization for MSMEs under the Scheme, in conjunction with business and trade organizations as well as selected commercial and rural

banks. The scheme aims to provide emergency relief funds for MSMEs and entrepreneurs in Ghana; develop a comprehensive and financially viable emergency relief fund package for MSMEs, and give technical support to MSMEs to offset the impact of COVID-19. Other policies identified in the Annual Progress Report (2020) to support MSMEs are the enactment of the Ghana Enterprise Agency Act, 2020 (Act 1040) which was passed to promote and develop MSMEs and increase funding for the National Entrepreneurship and Innovation Programme (NIEP). NEIP received an amount of GH¢ 66,764,201 instead of a budgeted allocation of GH¢ 37,465,808 confirming the government's commitment to developing MSMEs' in the country.

Moreover, the Annual Progress Report (2020) stated that the government has achieved some progress in the provision of infrastructure in the telecommunications and agriculture industries. Even though internet penetration fell to 84.89% in 2020 from 100.5% in 2019, broadband capacity used for ICT development increased by 81.7% to 759.29. The rise was brought about by an increase in the number of submarine cables landing in Ghana. Five submarine cable licenses were given to operators in the nation before the end of 2020. The number of service providers grew from 38 in 2019 to 49 in 2020. Furthermore, 30 Ministries, Departments, and Agencies (MDAs) and 257 Metropolitan, Municipal, and District Assemblies (MMDAs) joined the e-Government Network Infrastructure. With its goal to increase the use of ICT for development, the government established the SMART workplace, added 350 public institutions to the National Information Technology Agency (NITA) system, finished the e-Parliament solution, e-Procurement system, and e-Cabinet, deployed the e-Justice system in 43 High Courts, approved the Cybersecurity Act, 2020 (Act 1038), and generated 1,800 digital employment and 2,200 auxiliary jobs at the Accra Digital Centre for the youth and vulnerable persons from low-income communities. Regarding agriculture, the government started building 50 warehouses as part of the "One District One Ware

House" initiative in 2018, of which 42 were finished by 2020. In 2020, 227 small earth dams were finished in the five northern regions as part of the "One Village One Dam" initiative. Under the Aquaculture for Food and Jobs (AFJ) initiative, the Ministry of Fisheries and Aquaculture Development built 108 ponds and 11 cages in 2020, except in the Savanna, Northern, and North East areas. A total of 103,400 fingerlings and 599 sacks of feed were distributed to 48 ponds and 4 cages. Two more public hatcheries were developed under infrastructure construction and are yet to be operational to provide high-quality fingerlings to the AFJ program.

In connection with youth development, the report indicated that the Youth Leadership and Skills Training Institutes (YLSTIs) were founded to give leadership training and skills to the youth. The number of youths trained grew from 1,597 in 2019 to 1,745 in 2020. Three (3) youth development centres were also refurbished to provide spaces for community engagement. The quantity of employment produced under the Youth Enterprise Scheme, National Entrepreneurship and Innovation Programmes surpassed the objective of 246,700 in 2020, reaching 265,463, up from 107,576 in 2019.

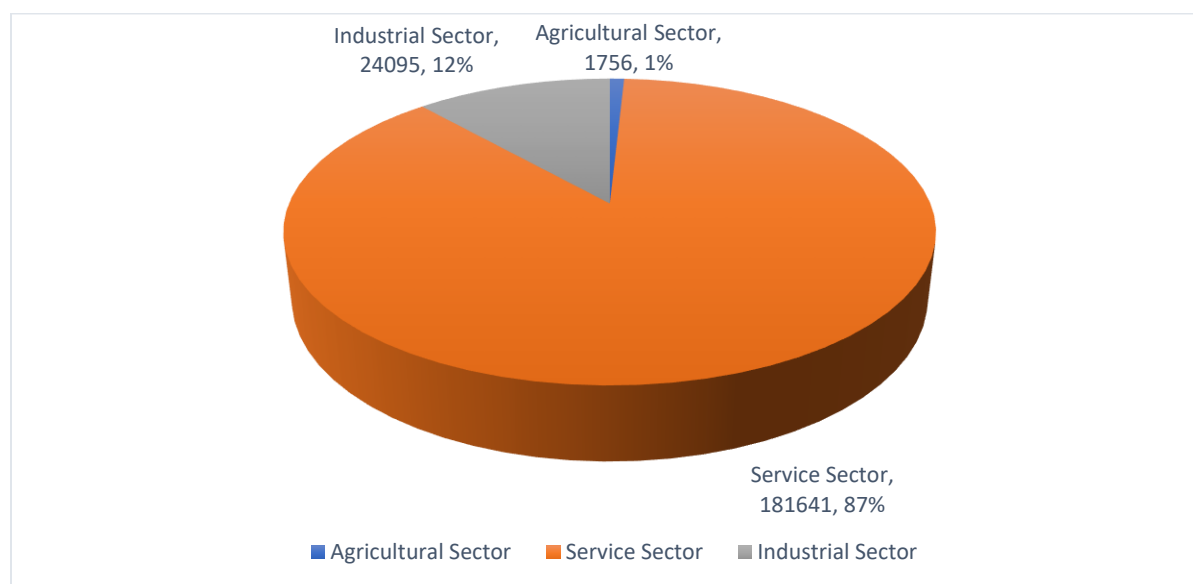
According to the 2021 World Bank Group Report on Accelerating Economic Transformation and Creating Jobs, Ghana has achieved a lot as a developing country but falls short in terms of quality education. They determined that Ghana's Human Capital Index (HCI) was 0.45 in 2020, meaning that a child born in Ghana today may be anticipated to be 45% as productive when he or she grows up as he or she could be if they experienced comprehensive education and full health. The educational system in Ghana does not produce graduates for industrial development (Gyeke-Dako et al. 2016). Over 50% of graduates from Ghana's universities and agricultural colleges, according to Agbeko (2018), do not find jobs after graduation in part due to the skill mismatch between what they learned in school and what is needed in the workplace. They are not trained to either be

entrepreneurs or fit into an industry that is evolving in terms of technology. This means the country will have to upgrade its educational system to produce graduates that will be technologically inclined to fit into any aspect of the industry. Education has been one of the government's priority areas over the medium term (2018-2021) according to the Annual Progress Report (2020). Government policy has primarily focused on ensuring that all people have equal access to and participation in high-quality education. The Pre-Tertiary Act, 2020 (Act 1049), which the President approved on December 29, 2020, provided the framework for TVET's reform. The establishment of the Ghana Technical and Vocational Education and Training (TVET) Service has significantly strengthened the government's resolve to make Technical and Vocational Education a top priority. As a result, the Ghana TVET Service now encompasses all technical and vocational programs managed by 19 separate Ministries, with the Director General of the Service reporting to the Minister and the Ministry of Education. This initiative was to resolve the challenges including the poor perception of TVET, the multiplicity of standards, testing and certification systems, and an informal TVET system that had been neglected and detached from the formal sector affecting the quality of TVET delivery.

2.4 Job Creation and Employment patterns in Ghana

The successive governments of Ghana have taken initiatives in creating new jobs to meet the fast-growing population over the years. According to the Integrated Business Establishment Survey Job Creation report (2015), a total of 207,492 jobs were created in 2014. The agricultural, service and industrial sectors recorded 1%, 87% and 12% new jobs respectively. Figure 2.1 below gives further details about the number of jobs created by the various sectors of the economy.

Figure 2. 1: Distribution of Jobs Created by Sector in 2014



Source: Ghana Statistical Service, IBES Phase 1

Out of the total number of jobs that were created in the country, 47,186 new jobs were created by formal establishments of which 81.5% were skilled jobs while unskilled jobs accounted for 18.5%. In the informal sector, a total of 160,306 new jobs were created of which 88% were skilled jobs and 12% were unskilled jobs.

In terms of ownership and size classification of establishments, the private sector (which includes public-private partnerships) created the highest number of jobs (182,856) during the period which accounts for nine times the number of jobs created by state-owned enterprises (24,636). This is an indication that the private sector can be considered the ‘engine room’ for the country’s economic growth when given much-needed attention. Therefore, policymakers must begin to look at policies that will enhance the sector’s expansion- both process and product cannot be disregarded. Encouraging and promoting innovation in the private sector can help create jobs for the ever-growing Ghanaian population. Table 2.1 gives further details about jobs created by the sector, MSML and ownership of establishments in 2014.

Table 2. 1: Jobs created by the sector, MSML and ownership of firms in 2014

Sector/MSML	State-Owned			Privately owned (Including PPP)		
	Total	Skilled	Unskilled	Total	Skilled	Unskilled
Total	24,636	21,121	31,515	182,856	158,440	24,416
Large	18,248	15,431	2,817	21,119	17,760	3,359
Medium	2,874	2,427	449	94,495	7,684	1,811
Small	3,128	27,760	368	29,453	28,516	937
Micro	382	501	(119)	122,789	104,480	18,309
Industry						
Total	1,406	1,245	161	22,689	26,090	(3,401)
Large	1,171	989	182	8774	6,967	1,807
Medium	63	99	(36)	989	972	17
Small	119	100	19	1,264	3,379	(2,115)
Micro	53	57	(4)	11,662	14,772	(3,110)
Services						
Total	23,075	19,780	3,295	158,556	131,261	27,305
Large	16,941	14,357	2,584	11,595	10,355	1,240
Medium	2,789	2,289	500	8,329	6,630	1,699
Small	3,020	2,692	328	27,823	38,841	2,982
Micro	325	442	(117)	110,819	89,435	21,384
Agriculture						
Total	155	96	59	1,602	1,089	512
Large	136	85	51	750	438	312
Medium	26	41	(15)	177	82	95
Small	(11)	(32)	21	366	296	70
Micro	4	2	2	308	273	35

Source: Ghana Statistical Service, IBES Phase 1

The Ghana Statistical Service Labour Force Report in 2016, reveals that 67.9% of all working-age persons were employed. The percentage of working males (71.4%) was higher compared to that of employed females (64.7%). According to the International Labour Organization, women are less likely than males to engage in the labour market in most nations, implying that they are less likely to be employed. In rural areas, 70.4% of the population was employed (Ghana Statistical Service, December 2016). The Labour Force report further indicates that 90% of the population aged 15 and above were working in the informal sector, with males accounting for 45.1% and

females accounting for 54.9%. Based on the report, 96.2% of the working population aged 15 and above in rural regions worked in the informal sector, compared to 84.1% in urban areas. Women outnumber males in the informal sector of work in both rural and urban areas. Additionally, more women were working in the informal sector in urban than rural regions (57.7% versus 52.4%), while more men were working in the informal sector in rural than urban areas (47.6% versus 42.3%). This may have been caused by the higher proportion of women engaged in commerce and service activities in urban centres than in rural ones.

The Ghana Living Standards Survey 2019 (GLSS7) indicated that the employment-to-population ratio was 65%. The rural and urban centres recorded a ratio of 69.5% and 61% respectively implying that a larger proportion of the urban population was without jobs compared with the rural population. A larger proportion of the female population was also without jobs with a ratio of 63.3% compared with 66.9% for males. The ratio varied among the various regions with the Volta region (73.8%) as the highest while the upper west region (50.8%) recorded the lowest (Ghana Statistical Service-Ghana Living Standards Survey (GLSS 7), 2019). The 2021 Ghana Population and Housing Census General Report also indicate that 50.3% of the population is employed. The urban centres recorded an employment rate of 50.2% while the rural areas recorded a rate of 50.4%. Tables 2.2 and 2.3 below give further details of the employment patterns in the country in 2015 and 2017 according to the 2015 labour force report and GLSS7 respectively.

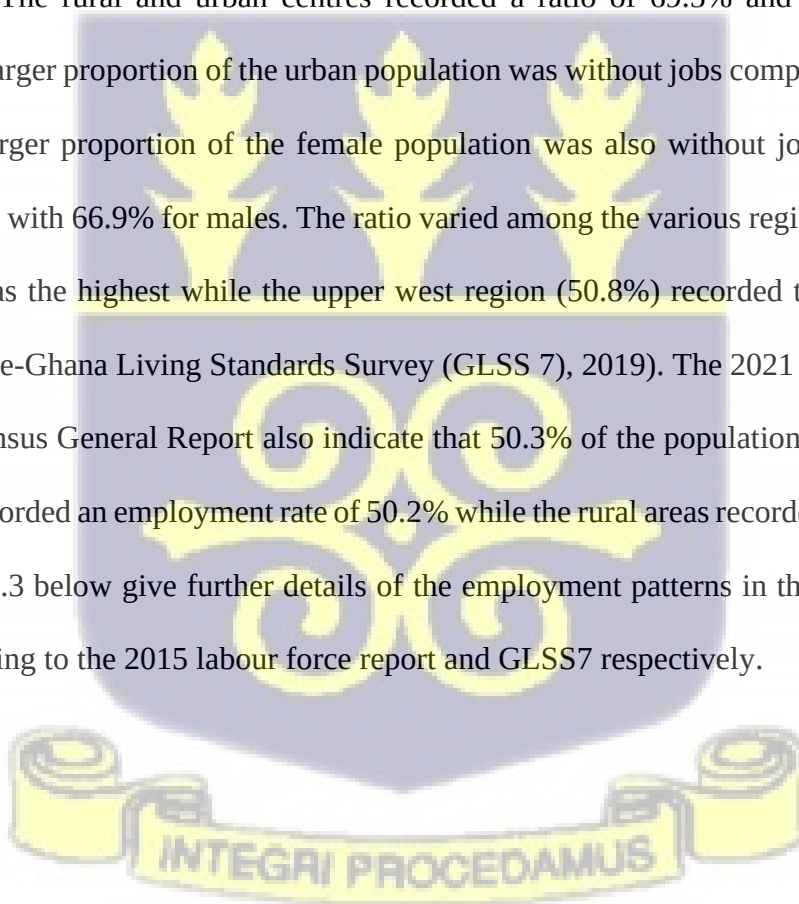


Table 2. 2 : Employment-to-population ratio for those aged 15 and up, disintegrated by locality, region, and gender in 2015.

Type of Locality/Region	Estimated Population			Estimated Numbers in employment			Employment-to-Population Ratio		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Ghana	13,712,631	6,000,163	7,712,468	9,270,939	4,284,334	4,986,605	67.6	71.4	64.7
Urban	7,254,897	3,073,303	4,181,594	4,722,101	2,105,788	2,616,313	65.1	68.5	62.6
Rural	6,457,734	2,926,860	3,530,874	4,548,838	2,178,546	2,370,292	70.4	74.4	67.1
Western	1,338,415	576,271	762,144	932,295	418,451	513,844	69.7	72.6	67.4
Central	1,282,588	538,882	743,706	876,010	386,437	489,573	68.3	71.7	65.8
Greater Accra	2,349,337	1,037,192	1,312,145	1,589,893	733,380	856,513	67.7	70.7	65.3
Volta	1,214,147	527,909	686,238	833,483	379,589	453,894	68.6	71.9	66.1
Eastern	1,641,655	729,486	912,169	1,082,839	518,611	564,228	66.0	71.1	61.9
Ashanti	2,693,473	1,134,166	1,559,307	1,682,207	765,178	917,029	62.5	67.5	58.8
Brong Ahafo	1,175,593	527,725	647,868	853,747	398,619	455,128	72.6	75.5	70.3
Northern	1,156,708	548,477	608,231	883,289	436,912	446,377	76.4	79.7	73.4
Upper East	529,378	241,844	287,534	310,931	149,177	161,754	58.7	61.7	56.3
Upper West	331,337	138,211	193,126	226,245	97,980	128,265	68.3	70.9	66.4

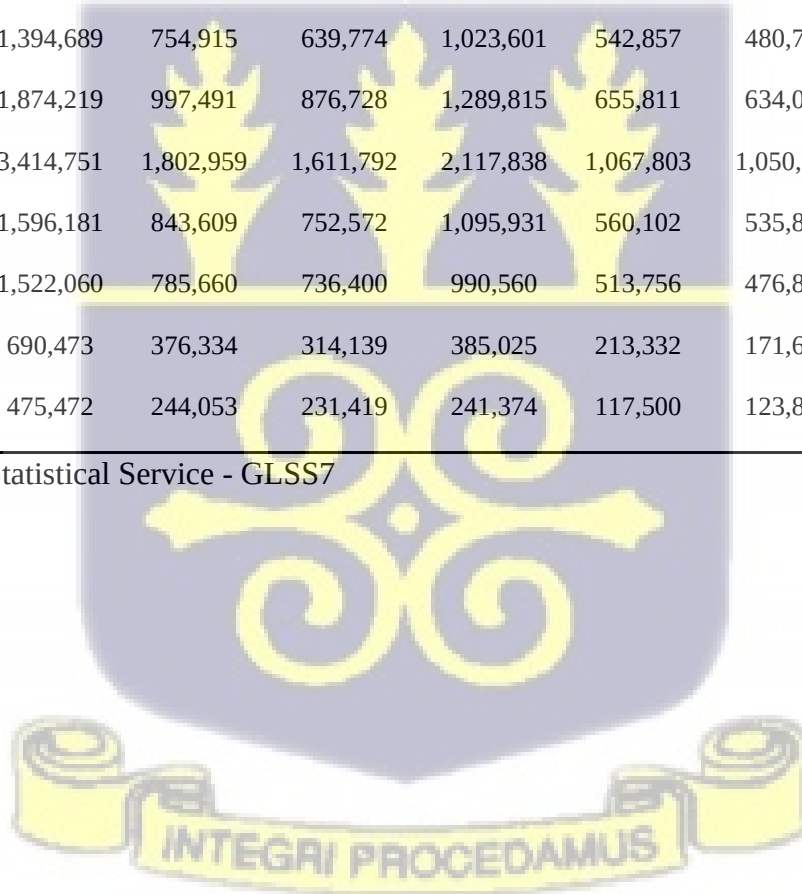
Source: Ghana Statistical Service – 2015 Labour Force Report.



Table 2. 3: By age group and sex, the employment-to-population ratio for people aged 15 and over in 2017

Locality/ Region	Estimated population 15yrs and above			Estimated number of employment			Employment-to-population ratio		
	Both Sexes	Female	Male	Both Sexes	Female	Male	Total	Female	Male
Ghana	17,258,257	9,166,763	8,091,493	11,216,724	5,802,474	5,414,250	65	63.3	66.9
Urban	9,233,175	4,981,351	4,251,824	5,636,118	2,946,397	2,689,722	61	59.1	63.3
Rural	8,025,082	4,185,412	3,839,670	5,580,606	2,856,077	2,724,529	69.5	68.2	71
Region									
Western	1,782,186	929,968	852,219	1,196,127	604,715	591,412	67.1	65	69.4
Central	1,465,886	816,705	649,181	1,013,051	555,006	458,045	69.1	68	70.6
Greater Accra	3,042,339	1,615,070	1,427,268	1,863,401	971,592	891,809	61.2	60.2	62.5
Volta	1,394,689	754,915	639,774	1,023,601	542,857	480,744	73.4	71.9	75.1
Eastern	1,874,219	997,491	876,728	1,289,815	655,811	634,004	68.8	65.7	72.3
Ashanti	3,414,751	1,802,959	1,611,792	2,117,838	1,067,803	1,050,035	62	59.2	65.1
Brong Ahafo	1,596,181	843,609	752,572	1,095,931	560,102	535,829	68.7	66.4	71.2
Northern	1,522,060	785,660	736,400	990,560	513,756	476,804	65.1	65.4	64.7
Upper East	690,473	376,334	314,139	385,025	213,332	171,693	55.8	56.7	54.7
Upper West	475,472	244,053	231,419	241,374	117,500	123,875	50.8	48.1	53.5

Source: Ghana Statistical Service - GLSS7



2.5 Unemployment Patterns in Ghana

Despite the government's attempts to create jobs and provide employment opportunities in both the formal and informal sectors, many people remain unemployed. According to the Labour Force Survey Report in 2016, about 1,250,913 persons aged 15 years and above were unemployed. About 52.2% of this number were females while 42.8% were males. In the urban areas, 58.6% were unemployed while the rural areas accounted for 41.4% of unemployed people.

In 2017, the Ghana Living Standards Survey 2019 (GLSS7) by the Ghana Statistical Service revealed that a total of 1,027,594 people 15 years and above were estimated to be unemployed. Out of this number, 57.4% were females while 42.6% were males. 70% of this number was in urban centres while 29.6% was in rural areas. This number varied among regions with Greater Accra and Ashanti Region accounting for 24.2% and 23.7% respectively. The 2021 Ghana Population and Housing Census General Report indicate that; 7.8% of the general population was unemployed with rural areas recording a rate of 7.0% while urban centres recorded 8.3%. Tables 2.4 and 2.5 gives further details of the unemployment rates in the country in 2017 according to the 2015 labour force report and GLSS7 respectively.

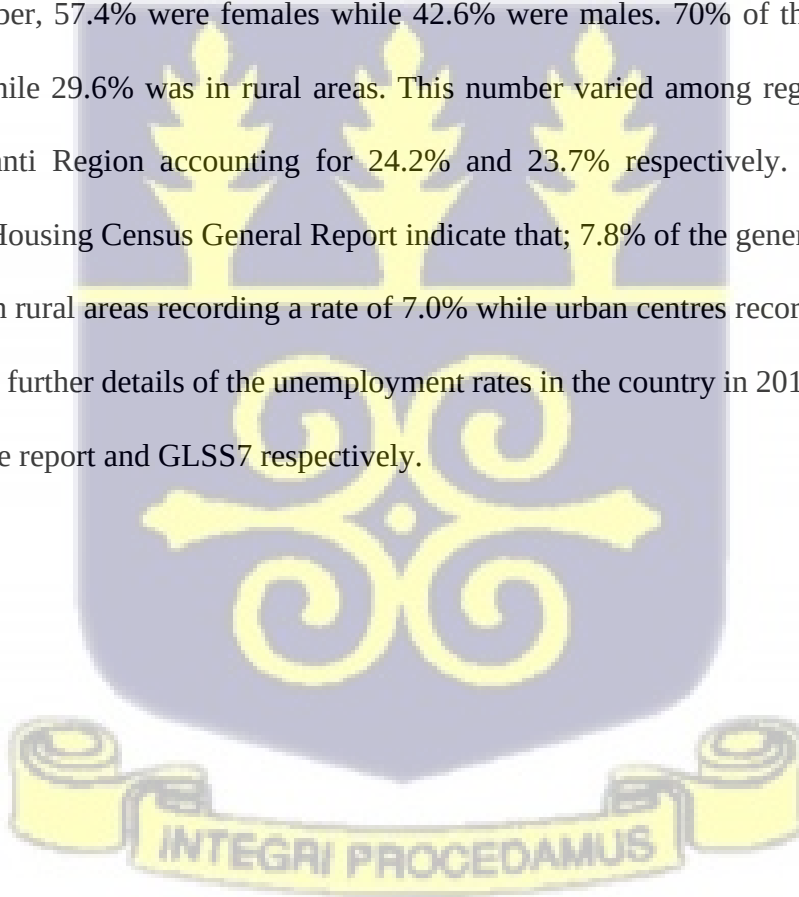


Table 2. 4: In 2015, the unemployment rate for those aged 15 and up varied by region, type of settlement, and gender.

Region	Urban			Rural			Total		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
Western	14.3	12.9	13.4	8.1	9.6	8.9	10.4	11.1	10.8
Central	13.6	15.8	14.8	9.1	7.7	8.3	11.2	11.3	11.2
Greater Accra	15.4	12.7	14.0	17.5	19.5	18.6	15.6	13.3	14.4
Volta	7.7	14.1	11.5	6.9	11.0	9.1	7.2	12.1	9.9
Eastern	10.8	15.6	13.6	3.9	6.9	5.4	6.6	11.1	9.0
Ashanti	13.1	13.8	13.5	13.8	17.3	15.7	13.4	15.1	14.3
Brong Ahafo	12.2	9.3	10.6	8.8	4.8	6.8	10.1	6.8	8.4
Northern	7.6	15.1	11.6	5.4	11.4	8.5	6.1	12.6	9.5
Upper East	21.0	13.9	17.3	17.2	20.0	18.7	18.0	18.7	18.4
Upper West	8.5	23.2	16.9	12.6	15.6	14.4	11.8	17.0	14.8
Total	13.2	13.6	13.4	9.0	11.3	10.2	11.1	12.5	11.9

Source: Ghana Statistical Service – 2015 Labour Force Report.



Table 2. 5: *The unemployment rate for those aged 15 and up varied by region, type of settlement, and gender in 2017*

Region	Ghana			Urban			Rural		
	Both Sexes	Female	Male	Both Sexes	Female	Male	Both sexes	Female	Male
Ghana	8.4	9.2	7.5	11.4	12.0	10.7	5.2	6.2	4.1
Western	8.8	10.1	7.4	14.4	16.2	12.2	4.7	5.0	4.4
Central	7.4	8.8	5.6	9.5	10.8	7.9	5.4	6.9	3.6
Greater Accra	11.8	11.0	12.7	12.3	11.7	13.0	6.6	4.6	8.9
Volta	4.7	5.8	3.5	6.3	7.5	5.0	3.9	4.9	2.8
Eastern	6.8	7.9	5.6	9.3	9.1	9.6	5.0	6.9	3.0
Ashanti	10.3	11.9	8.7	12.7	14.1	11.2	6.5	8.4	4.5
Brong Ahafo	6.0	7.2	4.8	8.6	9.4	7.6	4.0	5.3	2.7
Northern	6.9	7.8	6.0	10.9	13.5	8.2	5.2	5.5	5.0
Upper East	7.7	7.9	7.5	12.8	13.8	11.5	6.1	5.9	6.3

Source: Ghana Statistical Service - GLSS7

Comparatively, table 2.4 and 2.5 indicates that there is a downward trend in the unemployment rate in Ghana, decreasing from 13.4% in 2015 to 8.4% in 2017 and further decreasing to 7.8% in 2021 according to the 2021 Ghana Population and Housing Census General Report. Both male and female unemployment rates also fell among the country's various regions and between rural areas and urban centres, indicating that the country's successive governments have made some progress in minimizing unemployment.

With regards to the youth unemployment rate in Ghana, the Ghana Living Standards Survey (GLSS7) indicated that youth unemployment which is an important indicator in monitoring the millennium development goals was 13.8% for females and 12.6% for males. The rate varied among

the various regions in the country with Greater Accra recording the highest rate of 17.6% while the northern region recorded the lowest rate of 8.6%. Table 2.6 gives further details about the unemployment rate of the population 15-35 years by region, type of locality and sex in 2017.

Table 2. 6: *The unemployment rate for people aged 15 to 35 years varied by region, type of settlement, and gender in 2017.*

Region/Type of locality	15 to 24 years			25 to 35 years			15 to 35 years		
	Women	Men	Both	Women	Men	Both	Women	Men	Box
	Sexes			Sexes			Sexes		
Total	19.1	17.9	18.5	10.3	6.9	8.7	13.8	11.4	12.6
Western	17.1	20.1	18.5	12.5	4.9	8.8	14.3	10.5	12.5
Central	18.1	12.5	15.3	8.8	4.9	7.2	12.5	8.4	10.6
Greater Accra	26.2	34.2	30.2	11.6	11.4	11.5	16.3	19.1	17.6
Volta	10.8	7.9	9.2	7.4	3.2	5.5	8.9	5.6	7.3
Eastern	16.6	10.3	13.3	10.9	7.3	9.1	13.3	8.7	11.0
Ashanti	32.3	29.2	30.8	11.8	7.7	9.8	18.5	14.8	16.7
Brong Ahafo	15.1	15.7	15.4	9.0	3.8	6.5	11.8	8.9	10.4
Northern	10.7	9.0	9.9	7.9	7.0	7.5	9.1	8.0	8.6
Upper East	14.6	15.7	15.1	6.8	6.0	6.4	10.7	11.2	11.0
Upper West	13.2	11.7	12.3	8.3	4.2	6.2	10.4	8.1	9.1

Source: Ghana Statistical Service - GLSS7

2.6 Women's Business Participation

According to the Ghana Population and Housing Census 2010, females make up 51.2% of the overall population and 52.5% of the working-age population. This data may imply that women should participate in the labour force more than men. However, this is not the case due to impending labour market rigidities in Ghana. According to Sackey (2005), despite some relative progress in women's labour-force involvement due to female activism and the major role

performed by most women, particularly single mothers, in the household, men continue to dominate. The 2021 Ghana Population and Housing Census prove the dominance of males in the labour force by indicating that Males (63.5%) have significantly higher economic activity than their female (53.0%) colleagues, with a higher substantial difference between males (63.6%) and females (51.5%) in rural areas.

A 2014 analysis by the International Finance Corporation (IFC)-World Bank Group found that women business owners of SMEs make a substantial contribution to economic growth by facilitating job creation, stimulating faster economic growth, and maximizing the potential of women. According to the analysis, 8–10 million formal SMEs are thought to be owned entirely or in part by women worldwide; hence, promoting female economic prospects as well as business owners can advance equality between the sexes, favorably impact a rise in per capita income, and lessen poverty. However, women in business confront several obstacles, both financial and non-financial, and female entrepreneurs in most cases see access to capital as a key limitation to their business operations compared to their male counterparts. The lack of reliable gender-disaggregated data makes it more difficult for women-owned businesses to acquire credit. (International Finance Corporation(IFC)-World Bank Group, 2014). This is because it makes it more challenging to present a genuine argument to financial institutions regarding support for firms that are managed by women. Banking institutions must have a better understanding of both the existing market opportunity and the limits that women enterprises encounter. This information must be available at the national and regional levels for them to develop policies to better meet the requirements of female-owned businesses.

In 2007, the International Finance Corporation-World Bank Group and the Ministry of Women and Children Affairs-Ghana (presently Ministry of Gender and Social Protection) specify that the

Ministry of Gender and Social Protection is the primary institution in Ghana that oversees the issues of women and children. The overall mandate of the Ministry is to “...*initiate/formulate policies and promote gender mainstreaming across all sectors that will lead to the achievement of gender equality and empowerment of women, survival, development and growth of children as well as ensuring the protection of the rights of women and children*”. The International Finance Corporation-World Bank Group further indicated that other international conventions champion the course of women and children as well as other gender-related issues. Among them is the Convention on the Elimination of All forms of Discrimination against Women (CEDAW) which is the international convention that most comprehensively deals with the rights of women. Other global statutes protecting women's rights comprise those that uphold the right-to-work clause outlined in the ILO conventions. Both the African Union (AU) and the Economic Community of West African States (ECOWAS) of which Ghana is part have taken initiatives to tackle the challenges of achieving gender equality in Africa. The AU vowed to uphold the concept of fairness and gender parity in its founding document thereby enabling the institutionalization of women's empowerment and greater political involvement of African women in international decision-making. The ECOWAS with support from the United Nations Economic Commission for Africa (UNECA) restructured its regional gender strategy and included gender concepts into the contemporary strategic plan, which was endorsed in a stakeholder summit held in September 2003. Article 36(6) of the 1992 constitution of Ghana states that the “state shall afford equality of economic opportunities to all citizens; in particular, the state shall take all necessary steps to ensure the full integration of women into the mainstream economic development of Ghana”. All these are initiatives taken by the Ghanaian government to ensure that women are not left out of any major economic activity that will promote economic growth, development, and job creation as the Ghana

Living Standards Survey (GLSS7) reveals a lower labour force participation among women (69.7%) in 2017 compared to 72% among their male counterparts.

Also, in 2007 the International Finance Corporation-World Bank Group and the Ministry of Women and Children Affairs-Ghana (presently Ministry of Gender and Social Protection) revealed that women in Ghana appear to be more involved in socio-economic activities compared with women from other parts of Sub-Saharan Africa non the less, these women face challenges in terms of entrepreneurship and their involvement in the private sector. These difficulties range from more general educational, cultural, and socioeconomic restrictions that hinder the range of women's participation to the more conventional, frequently static, and less dynamic informal sectors. This assertion is supported by the 2021 Ghana Population and Housing Census General Report which indicates that economic activity is higher among males (63.5%) than females (53%) alluding to the fact that women face various challenges that inhibit their progress.

According to the Ghana Living Standards Survey IV, women are the dominant group when it comes to processing agricultural produce or fish because over 90% of all the activities in that sector are performed by females. It is estimated by the International Finance Corporation that there are around 8 to 10 million SMEs with at least one woman as the owner in more than 140 countries, accounting for 32% to 38% of all SMEs worldwide.

The World Bank Group and the International Finance Corporation (IFC) (2014) identified some of the challenges (financial and non-financial) hindering the progress of female-owned enterprises. Among the financial difficulties are:

- Lack of collateral: most of the financial institutions in Ghana and around the world normally require collateral when someone is requesting a loan. Most of the time, the

collateral must be a fixed asset, such as property or a title deed, that is not available to women. It is estimated that women own just about 1% of registered land titles. Their inability to provide this collateral denies them any financial assistance from the institutions thereby affecting the growth of their business.

- **Insufficient financial framework:** the availability of collateral registries or credit bureaus will make it easy for women to have access to finance. This is because it will offer additional choices for credit assessment and security, such as moveable property, equipment liabilities, and others. Having a property document isn't necessary because of this. The inadequacy of this infrastructure does not make it easy for female entrepreneurs
- **Insufficient understanding and risk assessment:** Financial companies see women as riskier, which results in higher costs and/or worse profits. This has a negative influence on their willingness to loan facilities to them irrespective of whether the assumption is supported by evidence, history, or speculation. Banking companies will rather lend to people they know more.
- **Inadequate customization and unfair financing regulations:** most financial institutions don't recognize females as a distinctive market segment to take into account. Hence, they offer a variety of products that are not very suitable for female-owned firms. Banking firms also see female companies as micro-enterprises in need of microfinance-sized loans with a limited likelihood of obtaining larger loan facilities. They, therefore, have access to micro-loans but very little access to small and medium-sized loans. Women consider loan repayment schedules to be highly condensed and to have high rates of interest. This discourages them from asking for credit

- The high cost of funding: banks that are operating in rural areas incur a very high cost which raises their entire cost of finance. Consequently, the expansion of female-owned companies in these rural areas is undermined. Urban areas are where most investment banks' activities are located hence women-owned firms in distant places must turn to alternate funding sources. Women's businesses are further hampered by the limited time they have available owing to caring for their families as well as the considerable risk of safety and theft they encounter while travelling large distances for business.

The difficulties that women-owned SMEs have in obtaining financing are also closely related to difficulties that are not pecuniary in origin but negatively impact the growth potential of their businesses. Some of these non-financial challenges include:

- Investment environment condition: The extent to which SMEs are productive is constrained by an unfavourable investment environment. The recognized differences in property rights and legal capacity are particularly significant for women. Lawful and constitutional restrictions may make it difficult for women to sign contracts in their names. In other cases, women might not have very important legal documents like passports or national identity cards, which are requirements for banking operations. In certain nations, getting the spouse's approval is still necessary to open a bank account or start a business.
- Inadequate professional acumen: Women-owned businesses typically lack the professional skills and abilities necessary to expand and become profitable. The majority of women-owned businesses struggle with maintaining and tracking accounts, managing taxes, and comprehending compliance laws and regulations. Additionally, they cannot develop a long-term strategy with a strategic focus on certain markets, innovative products and services, and economic forecasts that will appeal to investors and banks.

- Limited networks: In contrast to their male colleagues, women in business tend to know comparatively few entrepreneurs. Therefore, compared to women, males do have greater social contacts, which gives them access to greater business ideas, information, and contracts. The lack of professional connections, role models, and mentorship opportunities, puts women at a disadvantage from the outset, which may have a negative long-term impact on their enterprises.
- Females' progress as business owners is also influenced by their social and cultural obligations: Starting a business may be challenging for women, and in certain situations, running them successfully due to cultural and social perceptions of gender roles. Most societies consider owning a business to be a male pursuit, while women are only allowed to care for the home. This hurts both their ability to make decisions and their willingness to take risks.

2.7 Conclusion

This chapter has shown that Ghana's economy needs to develop technologically. Many jobs have been generated throughout the years, yet unemployment still constitutes a significant socioeconomic issue that requires attention. The difficulties women confront prevent them from contributing their skills to the socioeconomic development of the Ghanaian economy. It is therefore necessary for the Ghanaian government to priorities policies that will lead to the creation of more jobs as well as giving women the opportunity to contribute to the socio-economic development of the country. The employment of modern technology in the various sectors of the economy especially in manufacturing and processing will also put the country on the path to becoming very competitive on the international market.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

Technology is known to always have an impact on job creation. The extent to which technology has impacted the employment dimensions of countries around the world has caught the attention of so many writers. This section takes a look at the literature on the relationship between innovation and job creation as well as the gender dimension. The first part reviews literature on how innovation affects job growth and the second part focuses on the gender and innovation.

3.2 Innovation and Job Creation

Technological innovation is the improvement of procedures and goods via the creation or use of novel technologies to enhance efficiency and outcomes (Stoneman, 1983). Feldman (200) however differentiated between incremental innovation which has to do with a small improvement in an existing product or production process and radical innovation which is concerned with coming out with a new product or new ways of production. Hence both process and product innovation can either be incremental or radical

Process innovation is an instance where a business applies fresh or enhanced production or processing methods (Stoneman, 1983). According to Pavitt (2003), process innovations are concerned with how organizations comprehend, organize, or drive change that will result in "competitive success."

Product Innovation pertains to the development and introduction of new or enhanced goods (Stoneman, 1983). Product innovation, according to Feldman (2000), is the development of new goods that can be quantified analytically through licenses or novel product launches.

The theoretical contributions of the relationship between innovation and job creation have focused on the disparities between innovation in products and processes. However, the general effects of the two kinds of innovation on job creation are not very clear. Innovation's effect on employment generation differs across different sectors of the industry. Horst and Lachenmaier (2010) found out that, while the impact can be seen in the manufacturing sector, it might not be very significant in the service sector. Some are of the view that innovation creates a lot of jobs, while others have also concluded that innovation destroys jobs-process innovation (Vivarelli, 2005). Horst and Lachenmaier (2010) enlightened that there is an immediate favourable impact of product innovation on employment which has to do with the increase in demand for the new product thereby necessitating the employment of new labour. There is however an indirect less obvious effect. When a company introduces a new product into the market, in the short run, the firm will enjoy some monopoly power since there are no competitors thereby reaping higher profits which will enable the firm to employ more people. This will continue until other companies either put comparable or superior products into the market. The firm's inability to cope with the competition coming from other firms can lead to low profits and by extension lead to a reduction in employment levels. Also, if the new product that has been introduced into the market is a substitute for the old one, the effect will not be clear. In this situation, the new employees would simply replace the old employees and so there will neither be job losses nor job creation. There can even be a decrease in the number of workers if the production of the new product requires less labour than the production of the old product. This is in contrast to the initial direct effect thereby rendering the final effect indeterminate. The labour-saving effect of process innovation quickly points out the direct effect of a reduction in employment. Process innovation which results in more efficient ways of production reduces the unit cost of production thereby leading to a reduction in the price of the

product. This stimulates demand hence leading to an increase in employment all over again. This effect might outweigh the initial direct effect of a reduction in employment. It is therefore difficult to draw a definite conclusion on the overall effect of process innovation on employment at the firm level.

Although innovation in processes and products are very much interlinked with each other and are carried out by firms at the same time, they are different and come from innovative procedures that are carried out at differing stages of the firm with distinct goals (Twumsai Baffour et al. 2018). Pinta (2001) focusing on the differences was able to identify a dissimilarity between two strategies which are competitiveness in technology and cost/price competitiveness. According to the study, competitiveness in technology is often dominated by product innovation which requires a lot of internal innovative efforts. Internal innovation includes research, development, design and new investments and is mostly done to increase the market share of the firm. Technological competitiveness focuses on coming out with either new products or making significant improvements on the already existing products to have access to new territories of the market as it enables them to reach new customers at every level of the market. The strategy of price/cost competitiveness, on the other hand, focuses on process innovation. The main aim is to attain a high level of efficiency with different technological procedures which will result in the reduction of the cost of production as well as the discovery of different ways of producing a particular product. Both technological competitiveness and price competitiveness are said to have different influences on labour demand.

As demonstrated by Harrison et al. (2014), Lachenmaier and Rottmann (2011), Hall et al. (2008), and Zimmerman (1991), product and process innovation are noted to have labour-stimulating effects (compensation effect) and labour-saving effects (displacement effect) on employment

levels. For instance, an increase in productivity resulting from process innovation often entails purchasing and installation of equipment requiring a lot of capital which usually requires less labour. This innovative process instantly leads to the displacement of workers leading to a decrease in the unit cost of production. The reduction in the unit cost of manufacturing may simply be translated into a price reduction. The fall in price may increase the demand for the product requiring the business to expand its level of production. For the firm to be able to increase its production capacity, it will require that more labour be employed hence increasing the level of employment all over again. Eventually, the impact of process innovation on employment is based on elements like the immediate labour-saving benefit of innovation, the competitive condition the firm is facing, the responses of customers to the product or its substitute and the rate at which the firms can enter or exit the market. On the other hand, introducing a new product into the market has the propensity of creating new demand for the innovative firm. There will therefore be the need for the firm to expand leading to an increase in the level of employment. Product innovation either entails the launch of a brand-new product or the enhancement of an already-available product. When a novel product replaces an existing one, there will be a significant decrease in the need for labour for the old product. Hence the total impact of product innovation on labour demand becomes unclear.

Marx's compensation theory provided the theoretical foundation for these opposing consequences. Economists developed a concept in the early nineteenth century that Karl Marx later coined the compensation theory (Vivarelli, 2014). This theory was very critical in addressing uncertainties about the immediate negative repercussions of technological transformation by identifying a few mechanisms of the market that could balance both the effect of product innovation on job creation

and the direct detrimental effect of process innovation on job creation (Vivarelli & Pianta, 2000).

This explanation was centred on six different market mechanisms which include:

- Compensation effect through new machines: The process innovation that causes labour displacement in the user sectors also provides jobs in the areas where this equipment is manufactured (Say 1964).
- Compensation effect through a decrease in prices: process innovation leads to employees being displaced on one hand. On the other hand, process innovation leads to a reduction in the production's per-unit cost which eventually leads to a reduction in the price of the product. The reduction in prices stimulates new demand which leads to additional production and employment (Vivarelli, 2014).
- Compensation effect through new investment: innovating firms can accumulate a lot of profits over time through a decrease in manufacturing unit costs because of technological advancement as well as the fall in product prices as a result of the reduction in the unit cost of production. These new profits can be invested into new ventures or expand the already existing business thereby creating new jobs (Ricardo, 1951)
- Compensation effect through a decrease in wages: Innovation's immediate ability to reduce labour costs by extension affects the labour market through price adjustment. The displacement of workers can stimulate them to offer their services at a very low wage. In a neoclassical framework where there is a very high level of substitution ability of labour and capital, a decrease in wages can result in a rise in demand for labour leading to an increase in the levels of employment (Vivarelli, 2014).
- Compensation effect through an increase in incomes: The Keynesian and Kaldor traditions proposed this mechanism. The distribution of the entire technical advancement process is

known to involve union participation in a typical Fordist mode of production. One cannot deny the fact that portions of the cost saving resulting from technical advancement are translated into increasing levels of earnings and consumption. This rise in consumption may result in the creation of new employment, which may offset the initial job losses caused by process innovation (Boyer, 1988a).

- Compensation effect through new products: coming out with improved versions of a product as well as entirely new products can create new jobs. This results from the emergence of new economic sectors where new employment may be created (Say, 1964).

Comparatively analyzing the effect of innovation on domestically-owned businesses and businesses with foreign ownership, Dachs and Peters (2013) posits that the displacement and compensating impacts of innovation may vary between domestically-owned and foreign-owned firms because both groups differ in vital aspects of innovation in both processes and products.

First of all, locally managed enterprises and foreign-owned firms have different firm-specific innovation capacities. Foreign-owned businesses usually have access to cutting-edge firm-specific assets including technology, branding, distribution, and knowledge that most domestically-owned businesses do not possess (Caves, 1996; Helpman et al. 2004). Organizational and managerial capabilities and practices are also part of these assets (Bloom & Reenen, 2010) hence firms that are owned by foreigners can easily benefit from these assets from their parent company. Additionally, a network of knowledge sharing is incorporated into every Multi-National Enterprise (MNE) (Gupta & Govindarajan, 2000; Williams & Lee, 2009) hence affiliates of the MNE gain from any information exchange throughout the world. Having the opportunity to learn from the parent company as well as other MNE affiliates in other nations puts foreign-owned companies ahead of locally controlled businesses in terms of innovation in process and product. A new

additional parent company's manufacturing technique, for instance, will be very valuable to the foreign-owned companies hence they can easily undertake an innovative process compared with their domestically owned counterparts. Therefore, foreign-owned businesses can, for example, launch new commodities onto the market with ease and reap very high profits from the sales of these new products which will eventually increase their employment levels (Dachs & Peters, 2013).

In addition, the market power that a firm enjoys in terms of ownership of goods or manufacturing methods influences its decision to engage in international production. Foreign-owned firms that are members of a global organization are more inclined to utilize this market power (Dunning, 1981). The market power a firm enjoys plays a very vital role in its price-setting behaviour and by extension affects its process and product innovation activities. In circumstances like this, it's difficult to determine how innovation and employment are related. Businesses having a significant level of market power can hold back a substantial amount of cost reduction. So, one will expect a significant negative link between process innovation and employment in firms that are managed by foreigners. Two opposing effects will arise. On one hand, firms with a lot of market power can charge very high prices for new products and this will lead to a decline in the product's demand and hence reduce employment levels. They can also steal businesses from other competitors by charging very low prices to stimulate a high demand thereby increasing employment levels.

Numerous studies comparing the innovation levels of domestic and foreign-owned companies have concluded that there is an increase in the innovation output of companies with foreign ownership when it comes to the sale of new commodities after controlling for other firm characteristics (Dachs et al., 2008 and Ebersberger et al., 2005). As opposed to that, expenditure on Research and Development (R&D) and other innovative inputs is higher among locally

managed businesses than foreign-owned businesses because the superior assets that foreign-owned firms possess may not encourage them to invest in R&D compared with the locally owned firms (Un & Cuervo-Cazurra, 2008).

Also, the complex nature of the relationship between innovation and job creation inspired researchers to probe and find out empirically how the two are related. So many studies have come out with evidence of the kind of correlation that exists between innovation and job creation. The studies differ by methodology as well as data used, with most of them using a survey of firms asking specifically about the kind of innovation undertaken. While some focused on developing countries, others also focused on developed countries.

In the case of developed countries, Bogliacino (2012) implored data from the Joint Research Centre-Institute for Prospective Technology Studies (JRC-IPTS) of the European commission. To be more specific, the research was centred around the European Union (EU) firms over a period of 19 years (1990-2008). The study aimed to ascertain the impact of Research and Development (R&D) on job creation. The study found out using the Least Squares Dummy Variable Corrected (LSDVC) estimator that there is a positive and strong correlation between Research and Development expenditure and labour demand even though the estimated elasticity is rather low, thus if a company decides to double its expenditure on R&D, its employment will increase by a margin of 2.3%. The research also discovered that there is a weak positive impact on R&D expenditure and employment in manufacturing firms. The study stated that Research and Development expenditures have a more significant influence on employment in high-tech manufacturing sectors than in low-tech manufacturing companies. Hence the employment creation effect of Research and Development expenditures is more obvious in high-tech manufacturing and service sectors but not very clear in the traditional manufacturing sectors. This is because both

high-tech manufacturing and service sectors are more associated with product innovation thereby increasing the demand for the innovative product but the traditional manufacturing sectors on the other hand is characterized by process innovation and declining demand. Horst and Lachenmaier (2010) using the IFO innovation survey of German manufacturing firms capturing firms' behaviour between 1982 to 2002 concluded using the GMM system estimation that the second lag of product innovation shows a weak positive impact on labour demand. This leads to the idea that the impact of product innovation takes time to manifest. The study discovered that process innovation has a positive significant effect on job creation. Dachs and Peters (2013) analyzed data from the Community Innovation Survey 4 (CIS) that covered 64,600 firms from sixteen European countries. The countries were made up of eight West (Denmark, Spain, France, Greece, Italy, Luxemburg, Norway and Portugal) and eight East European countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Romania, Slovenia and Slovakia) between 2002 and 2004. In the study, it was revealed that a 1% increase in the sales of new products leads to a 1% increase in gross employment indicating a positive and significant correlation between product innovation and employment in the manufacturing sector but there was rather a significant employment reduction associated with process innovation. The research indicated that product innovation had a favourable influence on employment in domestically-owned-grouped firms, domestically-owned firms and foreign-owned firms. For process innovation, the study revealed that the ownership status as well as the parent company's native nation is important in the employment abilities of the firm. The study concluded that process innovation led to a significant decline in the labour of only domestically owned non-grouped firms and non-European foreign-owned firms. Harrison et al. (2005) used firm-level data from CIS 3 for 4 large European countries: Germany, France, Spain and the UK to investigate empirically the effect of innovation on firm-level demand for labour and

concluded that, in the manufacturing sector, although there is a job displacement effect associated with process innovation, the compensation effect is prevalent, and there is a positive correlation between innovation in product and demand for labour. In the service sector, the job displacement effect of process innovation is not very obvious but the sales of novel products stemming from innovation in product account for a non-negligible percentage of employment growth. Van (1997), taking a data panel of 598 United Kingdom firms covering the period 1976 to 1982 did an analysis using the GMM-DIF estimates and discovered that there is a positive correlation between innovation and demand for labour. Piva and Vivarelli (2005) applied the GMM -SYS approach to 575 Italian industrial longitudinal data sets for the period between 1992 and 1997 and discovered a strong link between innovation and employment. Harrison et al. (2008) using business-level data from 4 European nations concluded that process innovation displaces workers whereas product innovation is labour friendly. Interestingly, Hall et al. (2008) found something quite different. The study found no indication of job displacement linked with process innovation but a positive association between product innovation and employment, using panel data of Italian manufacturing businesses from 1995 to 2003

In the case of developing countries, there are not many empirical studies but there exist a couple of interesting findings. Meschi et al. (2016) used unique longitudinal data covering all Turkish industrial companies during the period between 1992 and 2001. The study took Turkey as a classic example of a country that was developing and advancing technologically and analyzed how globalization and technological advancement are interrelated and how that affects the employment levels of both skilled and unskilled labour. On a panel data set consisting of around 15,000 businesses, the study applied the System Generalized Method of Moments (GMM-SYS) approach and concluded that, for developing countries, those that adopt skill-biased technological change

have increasing levels of employment. This suggests that innovation has a favourable effect on employment. Haile et al. (2016) used data from the Ethiopian Annual Survey of Large and Medium-Scale Manufacturing industries covering 1940 firms over the period between 1996 and 2004 to determine how trade, FDI and technology affect employment in Ethiopia. The research found using the GMM-SYS estimates that the use of foreign technology has a labour-augmenting effect on employment levels in the manufacturing sector. Finally, Goedhuys (2010) did a study on a few chosen sub-Saharan African nations using the least squares (LS) regression model and the quantile regression (QR) model and found that, companies with websites and active social media accounts, with a focus on product innovation record high employment rates.

3.3 Gender and Innovation

Research in economics, management and entrepreneurship, has made various contributions to the literature on innovation at the firm level but when it comes to the issue of gender and innovation very little has been done (Avenyo & Kraemer-Mbula, 2019). This has been associated with the prejudiced nature of innovation as well as its neutral nature (Alsos, 2013). Theoretically, the literature on innovation is criticized to be male-biased because it focuses on innovation that is carried out by men or in male-dominated industries (Ranga, 2010). Hence the research on innovation fails to consider and account for innovations that are carried out by women. But the issue is that women also introduce innovations. Evidence suggests that enterprises that are owned by women have introduced innovations which are directed towards addressing issues of economic growth and development (Lindberg, 2011). For instance, Okoń-Horodyńska et al. (2016) conducted a pilot survey on the role of gender in the innovation process in Poland and found that the development of organizational innovation was more associated with women while the development of new products is associated with men. Rosa and Sylla (2018) used the ordinary

least squares regression model and the logit regression model on data that was sourced from the survey on the financing and growth of small and medium enterprises in 2011 and the survey on financing growth SMEs in 2014 as well as administrative data from the linkable file environment. The study discovered that female-owned enterprises are more likely to introduce innovation with a 95.3 percentage point higher probability than their male counterparts. The study pointed out that in 2011, in all industries, majority of SMEs owned by women were 1.2 percentage points more likely than those owned by men to be more innovative. According to the study, in 2014, SMEs with a majority of female owners were more likely to be innovative in the manufacturing sector by 10.2 percentage points, in the hospitality and food services sector by 11.2 percentage points, and in the retail and trade sector by 12.5 percentage points compared with companies with majority male ownership. However, SMEs with a majority of female owners were less likely to be innovative in professional science and technical services by 10.5 percentage points compared to SMEs with a majority of male owners. Using annual longitudinal data from 411 companies in southern Indiana, the United States, Leicht et al. (1991) investigated whether male-headed businesses are more innovative than female-headed businesses. The research concluded that there is no difference between the innovative behaviour of male-owned firms and female-owned firms. There is therefore the need for both theoretical and empirical literature on innovation and gender to begin to look at the phenomenon by considering all the actors that initiate and implement the innovation process. Others believe that innovation should be gender-neutral rather than gender-biased (Fagerberg, 2005). They argue that the innovation process focuses on output such as goods, new organization or new processes obscuring the individual's contribution to the process as a whole. As a result, the gender of people who participate in the innovative process is not taken into consideration.

The dominant perspective in gender and innovation literature is the perspective of innovation as a result and gender as a factor. The research on gender variations in patenting and commercialization, as well as studies of male and female-owned businesses, demonstrate this point of view. This research often compares the abilities of men and women to contribute to innovation quantitatively. According to findings, getting industry research funding is more tied to industry participation than gender which implies that there are likely to be more complicated interactions between gender and industrial innovation (Bozeman & Gaughan, 2007). Whittington (2011), for instance, found that academic mothers are far less inclined to patent, suggesting that the impediment to women's ability to innovate is resulting from the intersection of gender and family responsibilities.

Regarding the innovation process, Foss et al. 2013 discovered that women are as innovative as men in coming out with new ideas, but the ideas of women are adopted within the institution. Additionally, the research revealed that women might find it difficult to get the necessary support needed to implement their ideas, a conclusion that is also backed by Poutanen & Kovalainen (2013). An explanation that is corroborated by organizational research is that, maybe, women are not viewed as innovators, which prevents them from having their ideas heard or they are not even evaluated for execution since they are viewed as inferior to the ideas of their male counterparts (Cooper, 2012). It is therefore very clear that women are not the ones lacking innovation capabilities but it is organizational practices and gender biases that hinder their innovative behaviour.

The perspective of taking gender as a variable also allows probing into how policies are directed at both men and women. For example, researchers have shown that there is gender bias among the awardees of research funding (Viner et al, 2004). This might be a result of the gender bias that is

inherent in innovation policy and research. Several academics have also mentioned that research that comparatively analyzes men and women in the results of innovation may already be skewed against women because they concentrate on the sectors that are associated with a particular gender (Kvidal & Ljunggren, 2014)

3.3.1 Gender theories, entrepreneurial orientation and innovation

According to gender theory, operating a business differs for men and women (Quaye et al. 2015). Rand and Tarp (2011) found that SMEs that are managed by women are more likely to provide their workers with additional benefits such as yearly leave, social benefits and medical coverage than their male counterparts. Gender disparities, according to Brush (2009), result from a macroenvironment that takes into account factors other than market forces which include cultural norms and society's expectations as well as the meso environment which includes the intermediate institutions and structures. The question, therefore, is whether the diverse management approaches utilized by male and female-owned businesses translate into distinct entrepreneurial attitudes of the male and female entrepreneurs.

Literature indicates that the entrepreneurial orientation of SMEs differs. Various scholars have investigated this subject, with varying results (Schillo, 2011). Moreno and Casillas (2008) in their study discovered that there is a strong interconnection between entrepreneurial orientation and firm growth which can have an impact on the innovative behaviour of the firm as well as its employment abilities, even though this relationship is a bit complex. But there is no doubt that the entrepreneurial orientation of a business influences its level of growth and by extension innovation and employment. Despite the large body of findings on the subject of entrepreneurial orientation, much has not been done in examining the gender difference in the whole phenomenon (Quaye et al. 2015).

The increasing relationship involving gender and successful entrepreneurship in recent times has stirred the interest of several researchers to probe into the area (Quaye et al. 2015). Some scholars have discovered that gender has become one of the most important factors influencing credit applications, loan refusal, borrowing rates, and access to financing (Cavalluzzo et al. 2002; Cavalluzzo & Wolken, 2005). Dejene (2007) indicated that leadership, as well as decisions and levels of engagement in society, are influenced by gender.

The Essentialist and Constructive schools of thought were the two primary views used by Sabbe and Aelterman (2007) to examine the topic of gender. The essentialists are of the view that there are innate differences between the sexes that accounts for the divergent social behaviours existing between men and women. As a result, the qualities of being male and being female are seen as two opposing attributes and are considered to represent the respective innate qualities of men and women. It can therefore be inferred from socialization models that men and women either decide to innovate or not based on the kind of exposure they get in society because no individual is born with particular behavioural traits, the exposure they get in society plays a vital role in their behaviour and way of thinking. The constructionist on the other hand strongly believes that gender is actively constructed through factors other than biology, hence gender is not purely biological. This school of thought maintain that one's gender performance is based on three main elements which comprise one's self-definition, objectives, core values, and expectations of one's interaction with other partners and the context in which those interactions occur.

There are other feminist perspectives which are the Liberal Feminist (LF) and Social Feminist (SF) theories (McMahon, 2005). The LF argues that innately, males and females are the same and so firms that are owned by females can equally be as innovative as those owned by males if they both operate on an even playing field. Challenges such as access to finance, market, prospects and

education among others are what hinder the progress of female-owned firms. The SF on the other hand posits that women and men are different both innately and socially and that accounts for the differences in their innovative behaviour. In terms of organization and the production of goods and services, women behave differently because their motivation, incentives, objectives and ways of thinking are different from men.

Drawing from institutional, risk aversion and resource dependency theories, there are explanations regarding the differences that exist between the innovative behaviour of male and female-owned firms. Innovation choices are often made based on internal and external institutional considerations that influence the level of risk that the choice may have on its execution (Audretsch et al. 2020). Other studies that endorse this theory contend that institutions' and innovators' decision-making processes are important for innovation (Link & Scott, 2005).

Williamson (2000) breaks down institutions into four social analysis levels to characterize them. These levels are placed in ascending order, with the upper-level setting restrictions on the lower one. Norms, customs, traditions, values, and other elements of society act on the first level. It consists of unofficial institutions. Constitutions, laws, property rights, and other formal norms make up the second level (institutional environment). Institutions of governance make up the third level, and contract governance is given paramount emphasis here. The fourth and last level is where resource allocation, employment, price equilibrium, and other factors take place. While the formal institutions create an even playing field in terms of opportunities offered to male and female-owned firms, the informal institutions, on the other hand, disclose a different situation for females (Carrasco, 2014). It might have an impact on their intentions to innovate and take a risk as business owners.

The pervasive and arbitrary corruption of an informal institution is generally connected to varied viewpoints and perceptions of business risk and uncertainty (Audretsch et al. 2020). Due to the disparities between men's and women's tastes, societal norms, and perspectives on uncertainty and risk, male-owned businesses may react to both forms of corruption differently than female-owned businesses (Croson & Gneezy, 2009).

According to Audretsch et al. (2020), when a business owner decides to innovate either in process or product, he or she weighs the risk, the degree of uncertainty as well as the likelihood of a positive result. People may be discouraged from taking a decision that results in innovation as a result of the dominance of informal institutions in a nation. A common illustration is in nations where it is anticipated that officials may alter the frequency and magnitude of bribes (Fredriksson, 2014). Arbitrary corruption might make innovation more expensive, which would discourage company owners from adopting new technologies. Most people believe that women are less risk-taking than males and are more likely to defer innovation if they sense a high level of uncertainty in the business environment (Estrin & Mickiewicz, 2011). Corruption may increase the cost of transactions, and decrease a company's profitability and ability to thrive (Audretsch et al. 2020). Comprehending the causes and effects of pervasive and arbitrary corruption as a form of "nature" is paramount in describing the level of risk aversion and innovation potential in male and female-owned businesses (Audretsch et al. 2020). These two types of corruption may be used to analyze institutional effectiveness and the environment that affects gender variations in preferences, behaviour, and societal practices (Atlas et al. 2009).

Pervasive institutionalized corruption, on the one hand, may make transactions easier by lowering inefficiencies and uncertainty (Khoury & Hitt 2020). Firms that pay bribes can easily overcome the 'red tap' hence paying bribes can easily become an enticing alternative for firms if the

magnitude of the bribe is less than taxes (Audretsch et al. 2020). Therefore, the nature of pervasive corruption aids in avoiding regulatory constraints and also lowers the amount of uncertainty because it is linked to lower risk in conducting business. Considering that women are supposedly less risk-taking (Gary & Gneezy, 2012), It can be hypothesized that female-owned firms will be more innovative in countries with a high level of pervasive corruption when risk and uncertainty are low compared with their male counterparts.

Arbitrary corruption, on the other hand, hurts businesses and also increases the level of risk and uncertainty as well as transaction costs if bribes are not institutionalized (Audretsch et al. 2020). Arbitrary corruption involves unofficial conventions and practices, and when expectations are not specified, the agreement's implementation is unpredictable (Cuervo-Cazurra, 2006). In this instance, the business owner is aware that paying a bribe won't result in a secure reduction in cost. The barriers to creating and commercializing new products are enormous for this sort of nature, which is related to the high cost of innovation. This will particularly deter female-owned firms from undertaking any form of innovation (Audretsch et al. 2020). Since women are considered more risk-averse (Croson & Gneezy, 2009) than men, it can be interpreted that female-owned businesses will either postpone or forego innovation. This indicates that female-owned businesses will be more cautious about innovation in an arbitrary environment than their male colleagues. It can therefore be hypothesized that female-owned businesses will be less innovative in nations with greater levels of arbitrary corruption when uncertainty and risk are high.

The resource dependency theory also gives further insight into the reasons why women can incur more or less risk (Ngoasong & Kimbu, 2019). This is usually attributed to their access to resources (Audretsch et al. 2020). In institutionally sound and economically advanced nations like the United States of America, women seek finance at a lesser rate than men do, but they also have a

comparable chance of getting investments (Becker-Blease & Sohl, 2007). This might not be the case in countries that are not so developed. Estrin and Mickiewicz (2011) are of the view that female-owned firms experience disadvantages in nations with weak governance and corruption. Other research has found that in an institutional setting, women face barriers to accessing resources that are crucial for innovation (Brush, 2006). Also, innovative expenses are increased in nations with high tax burdens and this will have a more significant effect on female-owned firms since they already face the challenge of limited resources (Jennings & Brush, 2013). Research indicates that there is a conflicting relationship between fiscal independence and company activity (Baliamoune-Lutz, 2015), since raising taxes is likely to divert funding meant for innovation and stifle risk-taking, R&D, and market entry. Due to the increased cost of conducting business, female-owned businesses will be particularly vulnerable to tax changes (Becker-Blease & Sohl, 2007). The environment for entrepreneurship and innovation is made more favourable by increased resource availability and financial freedom, with female-owned businesses being the most directly impacted. Therefore, in nations with better fiscal independence, female-owned businesses will be more innovative. Throughout the various stages of the business cycle, access to resources that are crucial for innovation varies (Belitski & Desai, 2019). More mature firms can easily accumulate more internal resources for innovation while newer businesses may need to rely on outside financial investments, and debt financing and will therefore not have resources that are readily available for innovation (Olsen & Cox, 2001). Also, equity investment is limited for female-owned businesses that find themselves within the early stages of the firm cycle and this, therefore, hinders their propensity of engaging in innovation. Female-owned firms will therefore be extremely innovative in the later stages of the firm life cycle.

3.3.2 Characteristics of entrepreneurialism-male vs. female entrepreneurs.

The concept of entrepreneur orientation was first defined by (Miller, 1983). Male and female entrepreneurs behave differently in terms of their orientation in the following ways:

- **Risk-taking:** A tendency to take risks is one of the key characteristics of an entrepreneur based on research (Bouchard & Basso, 2011). As a result, someone who doesn't take risks cannot be described as an entrepreneur. In this regard, a large number of researchers have examined the risk level of specific demographic traits like industry, gender, etc. The evidence regarding gender is conflicting and calls for additional research. A survey conducted by the Santa Clara Center for Innovation and Entrepreneurship with 268 MBA alumni business owners in 2000 revealed that while male and female entrepreneurs share many motivational traits, male entrepreneurs took greater financial risks than female entrepreneurs. Other laboratory and field investigations have also demonstrated that women are more risk-averse than men (Jianakoplos & Alexandra, 1998). However, Tan (2008) found something quite different. According to the research, women entrepreneurs outperform and also engage in ventures that are riskier compared to their male counterparts. This will affect the innovative behaviour of male and female-owned firms since innovation itself is a risky venture whose outcome is unknown implying that risk-loving people are more alike than risk-averse people to venture into innovation.
- **Competitive aggressiveness:** this refers to how the business interacts with its rivals (Schillo, 2011). This is heavily influenced by the firms' management and ownership. While some business owners will avoid competition, others will go after their rivals and their target market with determination. According to Eagly and Wood (1999), men are typically

perceived as being more powerful and aggressive than women, which can be observed in the way they approach competition. This indicates that a female-owned company is less likely to launch a new product if it learns that its rivals have launched new items

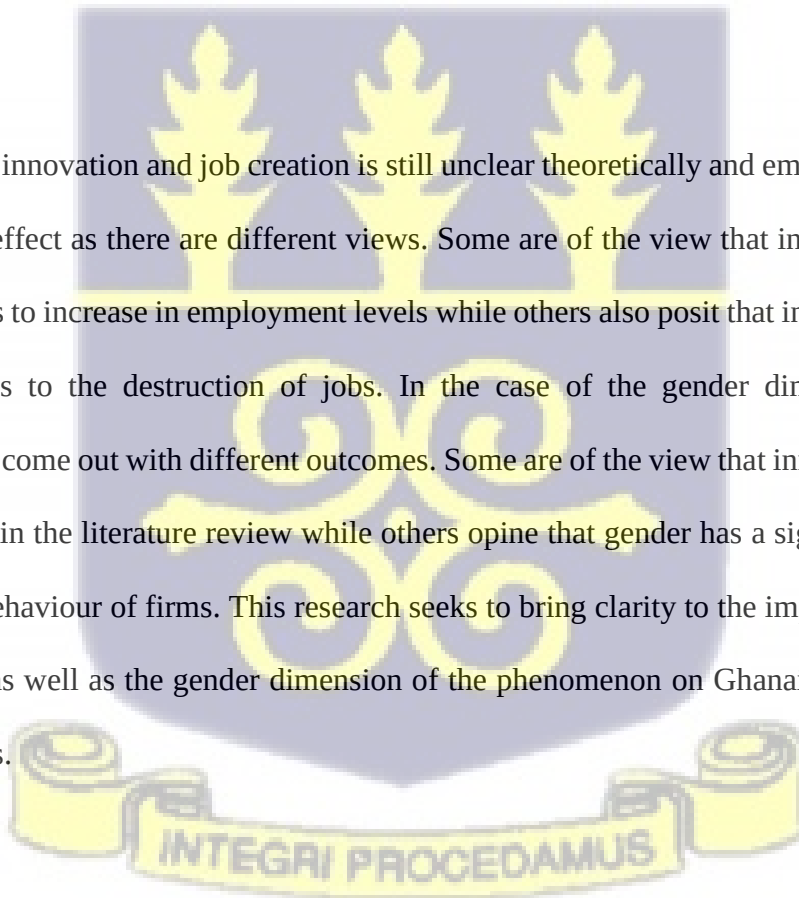
- **Autonomy:** This refers to an individual's or a team's capacity to independently come up with a concept and see it through to successful completion (Schillo, 2011). This also depends on the person or team leader who came up with the original idea. In comparison to their male counterparts, women are less likely to be able to complete an idea or vision of developing a new technique of production because they are known to be risk-averse (Jianakoplos & Alexandra, 1998).

The Covin and Slevin entrepreneurial orientation measure was used by Quaye et al. (2015) to analyze data from a survey of 300 SMEs in Accra Ghana, to answer three key questions. Does gender have any impact on SMEs' orientation toward entrepreneurship? Does the extent of entrepreneurial orientation of business owners depend on their gender and does the degree of entrepreneurial orientation depend on other demographic factors? The study discovered that there is a significant variance in risk-taking, proactivity and innovative orientation of SMEs owned by males and females which supports (Bristor & Fischere, 1993) assertion that males and females are different. Quaye et al. (2015) also discovered using education and age as control variables that gender which is a female dummy has a negative impact on entrepreneurial orientation implying that females are less likely to be entrepreneurially oriented compared with their male counterparts. This can also be attributed to the (Fossen, 2012) argument that gender disparities in entrepreneurship stem from socioeconomic factors. Fossen (2012) contends that spouses or family members capitalize women into business. Such women are therefore afraid of taking risks since any loss that will result from any risk-taking venture would be recapitalized by either their

husbands or relatives. This is very similar to innovation because a high level of innovation results in the ‘flexibility cures’- innovating companies exposed themselves to a high risk of failure (Boyer & Blazy, 2013). This indicates that taking into consideration Fossen’s (2012) argument, female entrepreneurs will be less innovative compared to their male colleagues. Finally, Quaye et al. (2015) found that education is the only demographic variable that co-varies with gender to impact the degree of entrepreneurial orientation. This is an indication that higher levels of education among women do not always transfer into a good entrepreneurial attitude. This may be because highly educated women will prefer a paid job that provides a stable income instead of opening their businesses.

3.4 Conclusion

The literature on innovation and job creation is still unclear theoretically and empirically about the direction of the effect as there are different views. Some are of the view that innovation (product innovation) leads to increase in employment levels while others also posit that innovation (process innovation) leads to the destruction of jobs. In the case of the gender dimension, different researchers have come out with different outcomes. Some are of the view that innovation is gender neutral as stated in the literature review while others opine that gender has a significant effect on the innovative behaviour of firms. This research seeks to bring clarity to the impact of innovation on job creation as well as the gender dimension of the phenomenon on Ghanaian manufacturing and service firms.



CHAPTER FOUR

METHODOLOGY AND DATA DESCRIPTION

4.1 Introduction

The technique and data utilized for the investigation are presented in this chapter. In further detail, it outlines the variables utilized in the study, specifies the models to be estimated, and goes through the econometric methods used to examine the research questions. It also describes the conceptual framework underlying the impact of innovation on job creation taking into consideration the gender dimension of the phenomenon

4.2 Model Specification

The correlation between innovation and employment is investigated by taking a closer look at the relationship between innovation and quantity of employment which is determined by the number of jobs available. A labour demand function serves as the basis for the estimating model. Following (Twumasi Baffour et al. 2018), the labour demand function is of the form represented by equation (1)

$$L_{it} = f(T_{it}, Q_{it}, X_{it}, \lambda_{it}) \dots\dots\dots (1)$$

Demand for labour (L_{it}) for firm i at time t is specified to be the dependent variable on technological innovation (T_{it}) for firm i at time t , product quality (Q_{it}) for firm i at time t in addition to observable variables (X_{it}) and non-observable variables (λ_{it}). The concept of product innovation has to do with improving upon the quality of a product or entirely coming out with a new product while process innovation is concerned with changes that are made to the whole manufacturing

process by way of improvement. There is an expected reduction in employment from process innovation due to a decrease in labour demand, non the less the reduction in the cost of production can easily be translated into a decrease in the prices of the firm's product which can lead to an increase in demand. This high demand can eventually lead to an increase in the level of production which has the propensity to increase the level of employment all over again. Therefore, the net impact on employment and whether the indirect positive effect surpasses the direct negative consequences rely on variables like the extent of a price decrease and price elasticity. Regarding product innovation, the anticipated impact on employment is based on the shifts in demand that the launch of the new product will cause.

To empirically ascertain innovation's impact on employment, there is the need for the introduction of other control variables of the characteristics of the firm thus (X) and also decomposing technological innovation into product innovation and process innovation. The regression below is obtained from equation (1).

$$\ln L_{it} = \delta_0 + \delta_1 PD_{it} + \delta_2 PZ_{it} + \delta_3 Female_{it} + \delta_4 Age_{it} + \delta_5 Asset_{it} + \delta_6 FDI_{it} + \delta_7 Union_{it} + \delta_8 Sector_{it} + U_{it} \dots\dots\dots (2)$$

Here, labour demand (L_{it}) is regressed on a set of independent variables which includes, Product Innovation (PD_{it}) of firm i at time t , Process innovation (PZ_{it}) of firm i at time t , Female (F_{it}) is a dummy variable of the owner of firm i at time t , taking the value of one when the firm owner is a female and the value of zero when the firm owner is a male, Age (Age_{it}) of firm i since it was established at time t , the asset ($Asset_{it}$) of firm i , thus looking at the total value of the firm's asset at time t , (FDI_{it}) is a dummy that represents the presence of foreign direct investment in the firm, ($Union_{it}$) is also a dummy that stands for the presence of trade unions in the firm, the sector

($Sector_{it}$) are fixed effects indicating the specific sector the firm belongs to and the error term (U_{it}).

The definition of all the variables used in the regression is provided in **Table 1** of the appendix.

This model will help us ascertain the impact of innovation on job creation in Ghanaian firms.

In determining the employment capabilities of male vs female innovative firms, the study introduces an interaction term between innovation and female dummy into equation (2). There are two separate equations for the process and product innovation as these makes it easier to ascertain their effect on employment. Interacting g female with innovation while keeping other firm characteristics, equation (2) takes the following forms for both product and process innovation respectively

$$\ln L_{it} = \delta_0 + \delta_1 PD_{it} + \delta_2 Female_{it} + \delta_3 (PD_{it} * Female_{it}) + \delta_4 Age_{it} + \delta_5 Asset_{it} + \delta_6 FDI_{it} + \delta_7 Union_{it} + \delta_8 Sector_{it} + U_{it} \dots\dots\dots (3)$$

$$\ln L_{it} = \delta_0 + \delta_1 PZ_{it} + \delta_2 Female_{it} + \delta_3 (PZ_{it} * Female_{it}) + \delta_4 Age_{it} + \delta_5 Asset_{it} + \delta_6 FDI_{it} + \delta_7 Union_{it} + \delta_8 Sector_{it} + U_{it} \dots\dots\dots (4)$$

To address the potential issues of bias, inconsistent estimates, and endogeneity, various estimating approaches for this model have been developed (see, for example, Lachenmaier & Rottmann 2007; Zimmermann 2009). This study then estimates equation (2) using panel estimation techniques. Because the measurements of innovation may be endogenous and dependent on total employment, the fixed effects estimators and the Hausman-Taylor estimator will be employed. To prevent correlated effects, the fixed effects estimator can address endogeneity by combining unobserved factors that simultaneously explain innovation and firm employment.

Endogeneity is controlled using the Hausman-Taylor estimator, which incorporates time-invariant variables linked with both innovation and employment. The estimator, by the instrumental method,

assumes that certain explanatory factors are related to individual-level random effects but none are correlated with the idiosyncratic error component. To account for time-invariant endogenous variables, the Hausman-Taylor estimator uses the average values of time-varying exogenous variables and their variances as instruments.

To understand the role of gender in a firm's innovative behaviour, the Probit model is used to run a regression on the determinants of innovation (product and process innovation). Product and process innovation are used as dependent variables and other firm characteristics as independent variables. The probit model is implored because it allows the use of a dichotomous variable as the dependent variable. Both product and process innovations are dichotomous variables that take the value of one if a firm engages in either of the two kinds of innovations and zero if of the firm does not. Two equations are specified for both product innovation and process innovation in equation 5 and 6. All the variables in the two equations below are the same as those stated in equation two.

$$\begin{aligned} \text{Probit } PD_{it} = & \delta_0 + \delta_1 \text{Female}_{it} + \delta_2 \text{Age}_{it} + \delta_3 \text{Asset}_{it} + \delta_4 \text{FDI}_{it} + \delta_5 \text{Union}_{it} \\ & + \delta_6 \text{Sector}_{it} + U_{it} \dots\dots\dots (5) \end{aligned}$$

$$\begin{aligned} \text{Probit } PZ_{it} = & \delta_0 + \delta_1 \text{Female}_{it} + \delta_2 \text{Age}_{it} + \delta_3 \text{Asset}_{it} + \delta_4 \text{FDI}_{it} + \delta_5 \text{Union}_{it} \\ & + \delta_6 \text{Sector}_{it} + U_{it} \dots\dots\dots (6) \end{aligned}$$

To ascertain the impact of both process and product innovation on job creation, the study uses the Fixed effect first difference regression model for Change in employment on equation 7 below

$$\begin{aligned} \ln L_{it} = & \delta_0 + \delta_1 PD_{it} + \delta_2 PZ_{it} + \delta_3 \text{Female}_{it} + \delta_4 \text{Age}_{it} + \delta_5 \text{Asset}_{it} + \delta_6 \text{FDI}_{it} \\ & + \delta_7 \text{Union}_{it} + \delta_8 \text{Sector}_{it} + U_{it} \dots\dots\dots (7) \end{aligned}$$

The definition of all the variables is the same as that of equation 2

4.3 Data Description

4.3.1 Research Design

The data used for this thesis is obtained from an enterprise survey of manufacturing and service firms in Ghana. The survey was conducted by the Department of Economics at the University of Ghana in collaboration with the Swiss Programme for Research on Global Issues for Development and the World Trade Institute at Bern for the project "Employment Effects of Different Development Policy Instruments in Ghana." A quantitative approach that included data collected from a nationally representative sample using a structured questionnaire was used to gather data. This approach's key strength is its ability to deliver concise answers to numerous inquiries that may be analyzed singularly or via combination (Davis, 2000). More crucially, the technique enables measurable repercussions to be measured and analyzed using a probabilistic investigation or technique analogous to a scientific investigation of a phenomenon. He pointed out that the method does have certain drawbacks. For example, because it is not intended to expose rich details of particular phenomena or qualities, it may not be ideal for analyzing more complicated or subjective circumstances or describing why such relationships exist in the way that they do. Additionally, it is inappropriate for comprehending interactions when no statistical analysis or in-depth discussions are used

4.3.2 Sampling Design

A stratified random sampling approach was used to choose a sample size of enterprises from both the Association of Ghana Industries (AGI) and the organization that monitors the operations of Ghana's Micro and Small Businesses (MSMEs) (NBSSI). Due to the lack of a more current

industrial census for Ghana, the survey depended on these sources (the most recent census at the time of the data collection was in 2003). The survey strata were the firm size and geographical location. The company sizes utilized were 1-5 (micro), 5-19 (small), 20-49 (medium), and 50+ (Large-sized firms). Ghana's administrative regions were chosen for their geographical location. The three Northern regions were eliminated since the lists collected from AGI and NBSSI had very few enterprises in these places; also, engaging them would be inefficient because their features weren't significantly distinct from those in other regions. Five different groupings were developed from Ghana's seven existing administrative units (Accra, Tema, Ashanti/Brong Ahafo regions, Central/Eastern regions, and Eastern/Volta regions) to comply with how the AGI and NBSSI register enterprises for administrative purposes.

$$SS = \frac{\frac{Z^2 * (p) * (1 - p)}{e^2}}{1 + \frac{Z^2 * (p) * (1 - p)}{Ne^2}}$$

A scientific technique was utilized to determine the right sample to employ, based on the formula presented above: where Z = Z value; p = percentage choosing an option, expressed in decimal; e = margin of error, stated in decimal; and N is the population size. Based on the formulae above, a sample of approximately 360 firms was suitable for a population of approximately 1,200 firms registered with the AGI and slightly more than 2,000 firms registered with the NBSSI, with the following assumptions: p = 0.5 (equal chance of being chosen at random from the population); 95% level of confidence (Z=1.96) and e = 5 =0.05. However, due to the high incidence of firm movement, attrition, and shifting of business tasks in Ghana, a starting sample of around 600 was chosen.

The survey sample was designed to include 300 small businesses (150 from AGI and 150 from NBSSI), 200 large businesses, and 100 medium businesses. This was founded on the features of enterprises registered with both the AGI and the NBSSI; AGI firms are mostly small, with a few medium and large-scale firms, but NBSSI firms are predominantly small. Enterprises registered in the Greater Accra (Accra and Tema) and Ashanti areas received a larger share since they formed the majority of firms registered with the AGI and NBSSI. This sampling approach is similar to that used in the World Bank enterprise survey. The distribution of the intended sample was as follows, based on the firm size description supplied by the AGI and NBSSI (see table 4.1)

Table 4. 1: Sampling Distribution

	AGI			NBSSI		Total
	Small	Medium	Large	Registered	Un-registered	
Accra	45	65	110	20	10	250
Tema	10	15	65	10	10	110
Ashanti/Brong Ahafo	40	20	10	20	10	100
Central/Western	25	0	15	20	15	75
Eastern/Volta	30	0	0	20	15	65
Total	150	100	200	90	60	600

Source: r4d Enterprise Survey

Note: N = number of firms; % = Percentage of Responding firms

4.3.3 Survey Instrument

A single questionnaire survey was created for both manufacturing and service enterprises, as well as for two separate data-collecting phases, however, the second phase did not include all aspects administered in the first phase. The first phase included nine (9) themes of questions: firm

background; entrepreneur characteristics; production, inputs, revenue, profits, and assets; exports; labour/employment; technology, innovations, and foreign direct investments; investment; finance; and public policies, business support, and perceptions of the broader business environment. The second part included questions on four (4) different themes: exports, revenue, costs, imports, employment, and innovation and technology. These questions were asked of business owners or managers during computer-assisted face-to-face interviews. The questions were primarily closed-ended, with a few open-ended ones that may need the aid of other firm workers such as accountants and human resource managers.

4.4 Characteristics of Responding Firms

4.4.1 Firm size

Table 4.2 shows the size distribution of the sampled enterprises. This category is based on the total number of workers reported by the companies during the survey. It differs significantly from the distribution shown in Table 4.1, which was based on AGI and NBSSI size classifications. Despite this, the sample fits very well with both the desired sample and the sorts of companies registered with the AGI and NBSSI; a considerably higher number of small-sized enterprises and a few medium and large-sized firms, as well as a higher proportion of Accra and Tema-based firms. For example, nearly 60% of the sampled enterprises were small-sized during the first phase of data collection, whereas slightly more than 66% were small-sized during the second phase. Furthermore, during the first phase of data collection, around 45% of the sampled enterprises were from Accra and Tema, whereas 44% were from Accra and Tema during the second phase. In general, fewer big enterprises replied than small and medium-sized firms during the second round of data collecting. Furthermore, in comparison to other cities, Accra and Tema had fewer

enterprises reply in the second round of data collecting. This might be because these places contain the highest proportion of enterprises in the targeted sample, or because the majority of large firms are situated in these areas.

Table 4. 2: *Distribution of Firm Size across Location*

	1st Phase				2nd Phase			
	Small	Medium	Large	N	Small	Medium	Large	N
Accra	42.31	26.92	30.77	130	44.35	25.22	30.43	115
Tema	42.19	20.31	37.50	64	72.73	25.00	2.27	44
Ashanti/Brong Ahafo	61.62	26.26	12.12	99	73.33	22.22	4.44	90
Central/Western	66.15	16.92	16.92	65	72.41	17.24	10.34	58
Eastern/Volta	56.54	14.29	5.71	70	87.72	10.53	1.75	57
N	242	95	91	428	241	76	47	364
%	56.54	22.20	21.26	100	66.21	20.88	12.91	100

Source: r4d Enterprise Survey

Note: N = number of firms; % = Percentage of Responding firms

4.4.2 Sector

In terms of the sectoral breakdown of the surveyed sectors, manufacturing firms constituted around 82% in both stages of data collection. For the first phase, the leading sub-sectors within the manufacturing sector were food (35%), chemicals (13%), and textiles (12%). The leading sub-sectors in the second phase were food (36%), clothing (13%), and chemicals. These three sub-sectors accounted for almost half of all manufacturing enterprises

Table 4. 3: *Distribution of Firms by Sector (Manufacturing)*

Manufacturing	1st Phase		2nd Phase	
	N	%	N	%
Food	125	35.41	109	36.21
Textiles	12	3.40	12	3.99
Garments	44	12.46	40	13.29
Leather	7	1.98	6	1.99
Wood	16	4.53	14	4.65
Paper	3	0.85	2	0.66
Publishing, printing and Recorded Media	18	5.10	16	5.32
Refined Petroleum Product	1	0.28	1	0.33
Chemicals	47	13.31	32	10.63
Plastics and Rubber	12	3.40	10	3.32
Non-Metallic Mineral Products	10	2.83	8	2.66
Basic Metals	16	4.53	13	4.32
Fabricated Metal Products	21	5.95	20	6.64
Machinery and Equipment	6	1.70	5	1.66
Office, Accounting and Computing	1	0.28	1	0.33
Electrical Machinery and Apparatus	2	0.57	2	0.66
Medical, Precision and Optical Instruments	1	0.28	1	0.33
Other Transport Equipment	3	0.85	3	1.00
Furniture	7	1.98	6	1.99
Recycling	1	0.28	0	0.00
Total	353	100	301	100

Source: r4d Enterprise Survey

Note: N = number of firms; % = Percentage of Responding firms

For the first phase of data collecting in the services sector, the major sub-sectors were construction (32%), retail (13%), and hotels and restaurants (11%). The building industry (33%), retail (11%), hotels and restaurants (11%), supporting and auxiliary transport operations (11%), and computer and associated activities (11%), were the major sub-sectors in the second phase. These industries accounted for approximately 77% of all service enterprises.

Table 4. 4: *Distribution of Firms by Sector (Services)*

Services	1st Phase		2nd Phase	
	N	%	N	%
Construction Section	24	32.00	21	33.33
Services of Motor Vehicles	5	6.67	2	3.17
Wholesale	3	4.00	3	4.76
Retail	10	13.33	7	11.11
Hotel and Restaurants	8	10.67	7	11.11
Water Transport	2	2.67	2	3.17
Supporting and Auxiliary Transport Activities	7	9.33	7	11.11
Post and Telecommunication	1	1.33	1	1.59
Financial intermediation, except insurance	2	2.67	2	3.17
Activities auxiliary to financial inter	2	2.67	2	3.17
Renting of machinery and equipment with	1	1.33	1	1.59
Computer and related activities	9	12.00	7	11.11
Health and social work	1	1.33	1	1.59
Total	75	100	63	100

Source: r4d Enterprise Survey

Note: N = number of firms; % = Percentage of Responding firms

These distributions are not significantly different from those seen in prior Ghanaian enterprise surveys. For example, in the World Bank enterprise survey, manufacturing enterprises outnumber services firms, with the former led by the food sub-sector. Similar distributions may be observed in the Ghana Statistical Services' Integrated Business Establishment Survey IBES, which is an economic survey of all sectors in the Ghana economy.

4.4.3 Type of Ownership.

In terms of ownership, the majority of the sampled enterprises were private local (about 86% in the first phase and 87% in the second). Private foreign enterprises (8% and 7% in both periods of data collection, respectively), combined local/foreign firms (6% and 5% in both phases, respectively), and cooperatives (0.5% and 0.6% in both phases) follow in declining order. In terms of gender, the data collection focused first of all the ownership of the firm, basically how many people owned the firm and if the owners are more than one, how many are male and how many are female and if it is just one owner then is the person a male or female.

Table 4. 5: *Distribution of firms by ownership*

Type of Ownership	1st Phase		2nd Phase	
	N	%	N	%
Private local	366	85.51	317	87.09
Private foreign	35	8.18	26	7.14
Joint local /foreign	24	5.61	19	5.22
Cooperatives	2	0.47	2	0.55
Total	428	100	364	100

Source: r4d Enterprise Survey

Note: N = number of firms; % = Percentage of Responding firms

4.4.4 Legal Status

A little more than half of the sampled firms were registered as limited liabilities. This was consistent across both data collection phases and was followed in descending order by sole proprietorships (43% and 45% in both phases, respectively), partnerships (4% in both rounds, respectively), and NGOs (less than 1% in both rounds).

Table 4. 6: *Distribution of firms by legal status.*

Legal Status	1st Phase		2nd Phase	
	N	%	N	%
Limited Liability	224	52.34	183	50.27
Partnership	17	3.97	16	4.4
Sole Proprietorship	184	42.99	163	44.78
NGO	3	0.7	2	0.55
Total	428	100	364	100

Source: r4d Enterprise Survey

Note: N = number of firms; % = Percentage of Responding firms

4.4.5 Firm Age

In terms of company age categorization and for the first phase of data collection, about 35% were founded less than 10 years ago; 33% were founded between 11 and 20 years ago; 15% were founded between 21 and 30 years ago; 7% were founded between 31 and 40 years ago; and 8% were founded more than 40 years ago. The age distribution of the sampled firms was similar to the first round of data collection in the second phase as shown in table 4.7 below

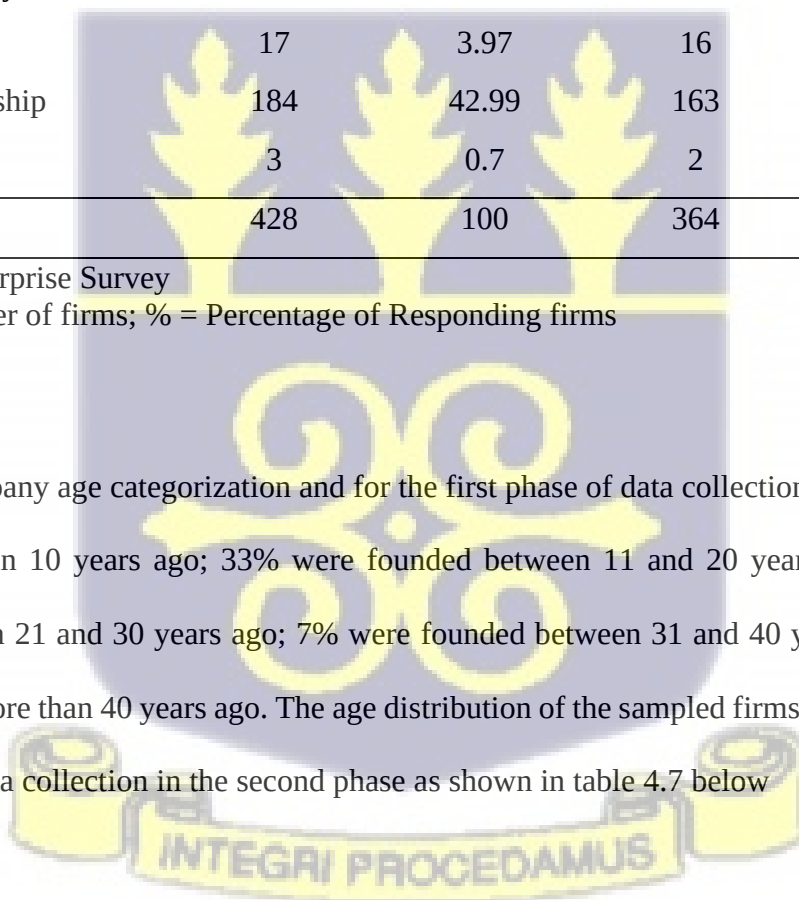


Table 4. 7: Distribution of Firms by Age

Firm Age	1st Phase		2nd Phase	
	N	%	N	%
0 - 10	152	35.51	129	35.44
11 - 20	143	33.41	127	34.89
21 - 30	68	15.89	57	15.66
31 - 40	30	7.01	25	6.87
41 or more	35	8.18	26	7.14
Total	428	100	364	100

Source: r4d Enterprise Survey

Note: N = number of firms; % = Percentage of Responding firms

4.4.6 Foreign Ownership

The sampled companies were primarily local (84% for the first round of data collection and 85% for the second round). Firms with foreign ownership account for about 16% of the first phase of data collection and 14% of the second stage of data collection (see table 4.8).

Table 4.1: Proportion of Firms that are Foreign Owned

Foreign Ownership	1st Phase		2nd Phase	
	N	%	N	%
Yes	67	15.65	51	14.01
No	361	84.35	313	85.99
Total	428	100	364	100

Source: r4d Enterprise Survey

Note: N = number of firms; % = Percentage of Responding firms

4.5 Data Collection

As previously stated, the survey was done in two stages. The first phase took place between July and September 2015, and 428 businesses out of 600 replied (the response rate was roughly 71%). The second phase took place between August and September 2016 for the 428 previously polled businesses, with 375 responding (the response rate was roughly 88%). Recall data for 2013 and 2014 were obtained in 2015, while data for 2015 was received in 2016. Data was gathered from industrial and service enterprises in seven different regions of the country. The next part discusses the background information of the key responding businesses

4.6 Descriptive statistics

The descriptive statistics of the main variables are shown in tables 4.9, 4.10 and 4.11 below for Product-innovative firms, Process-innovative firms and male and female-owned firms respectively. The F-value is obtained using the one-way analysis of variance (ANOVA), which is used to discover if there are any statistically significant differences between the means of two or more independent (unrelated) groups. It's also worth noting that the one-way ANOVA is an omnibus test statistic that can't tell you which individual groups were statistically significantly different from each other; it can only tell you that at least two groups were different. In this scenario, it will determine whether males and females vary in their innovative behaviour in the case of table 4.11. A post hoc test will then be conducted to identify whether gender differs considerably from the other in terms of innovative behaviour (who is more likely than the other to undertake an innovative venture as a firm owner be it a product or process innovation). The null hypothesis therefore is, there is no significant variance (5% or 10% significant level) in the means

of males and females in their innovative behaviour as firm owners, product innovators and non-product innovators as well as process innovators and non-process innovators and the alternative is that there is a variance.

H₀: $\mu_1 = \mu_2$

H₁: $\mu_1 \neq \mu_2$

Here, **μ_1** and **μ_2** are the means of males and females respectively

Table 4.9 reveals that there is a significant variance between the means of firms that undertake product innovative ventures and those that do not in terms of employment. The f-values of the other variables are clearly shown in the table. Table 4.10 also informs that there is a significant variance between the means of firms that engage in process innovation and firms that do not in terms of employment as the mean of process innovators is higher than that of the non-process innovators. There is however no statistically significant variance between the means of male and female-owned firms in their innovative behaviour (Product and process innovation) as shown in table 4.11. The means do vary, but the variance is not significant indicating that gender is not a significant factor in a firm's decision to innovate. The one-way ANOVA test to determine the innovative behaviour of male and female-owned firms as well as the post hoc test is found in Table 3 to Table 8 the appendix.

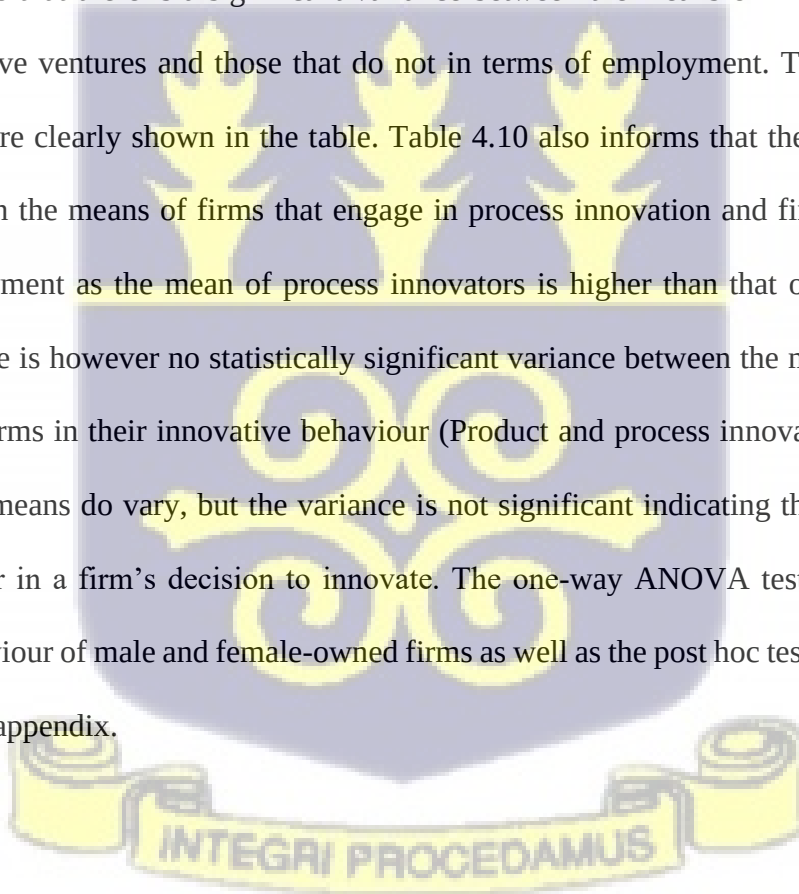


Table 4. 8: A summary of the statistics of the main variables-Product innovators and Non-Product Innovators

Variable		Overall		Product Innovators		Non-Product Innovators		Prob > F
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Log of Employment	overall	2.69	1.502	2.77	1.499	2.36	1.466	0.0002
	between		1.493		1.506		1.466	
	within		0.372		0.282		0	
Product Innovation	overall	0.79	0.410	1	0	0	0	
	between		0.159		0		0	
	within		0.378		0		0	
Process Innovation	overall	0.34	0.475	0.40	0.491	0.12	0.330	0.000
	between		0.354		0.414		0.330	
	within		0.318		0.269		0	
Log of age	overall	2.51	0.919	2.49	0.914	2.56	0.938	0.3183
	between		0.988		0.983		0.937	
	within		0.136		0.109		0	
Log of asset	overall	6.38	5.571	6.57	5.561	5.65	5.557	0.0138
	between		5.575		5.575		5.557	
	within		0		0		0	
FDI	overall	0.14	0.342	0.14	0.346	0.12	0.329	0.4999
	between		0.343		0.343		0.329	
	within		0		0		0	
Sector	overall	0.82	0.382	0.83	0.377	0.80	0.400	0.2873
	between		0.383		0.383		0.400	
	within		0		0		0	

Note: Firm Sample = 421

Table 4. 9: A summary of the statistics of the main variables-Process innovators and Non-Process Innovators

		Overall		Process Innovators		Non-Process Innovators		Prob > F
Variable		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Log of Employment	overall	2.69	1.502	3.01	1.522	2.52	1.461	0.000
	between		1.492		1.540		1.446	
	within		0.372		0.225		0.364	
Product Innovation	overall	0.79	0.410	0.92	0.267	0.71	0.452	0.000
	between		0.159		0.296		0.323	
	within		0.378		0.124		0.378	
Process Innovation	overall	0.34	0.475	1	0	0	0	
	between		0.354		0		0	
	within		0.318		0		0	
Log of age	overall	2.51	0.919	2.54	0.887	2.49	0.937	0.3294
	between		0.988		0.919		0.968	
	within		0.136		0.102		0.129	
Log of asset	overall	6.38	5.571	6.86	5.724	6.12	5.475	0.0223
	between		5.575		5.736		5.539	
	within		0		0		0	
FDI	overall	0.14	0.342	0.18	0.387	0.11	0.313	0.0003
	between		0.343		0.369		0.323	
	within		0		0		0	
Sector	overall	0.82	0.383	0.84	0.369	0.81	0.389	0.3032
	between		0.383		0.369		0.384	
	within		0		0		0	

Note: Firm Sample = 421

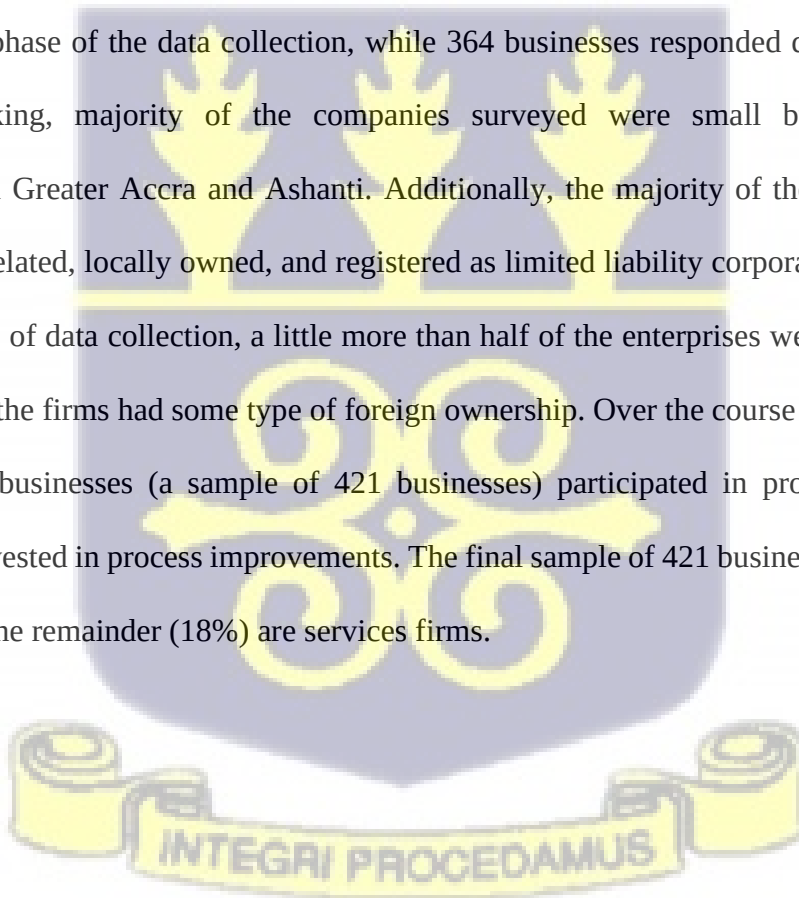
Table 4. 10: A summary of the statistics of the main variables-male and female-owned firms

Variable		Overall		Male-owned firms		Female-owned firms		Prob > F
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Log of Employment	overall	2.69	1.502	2.97	1.527	2.03	1.209	0.000
	between		1.493		1.524		1.160	
	within		0.372		0.363		0.398	
Product Innovation	overall	0.79	0.410	0.79	0.406	0.77	0.423	0.3162
	between		0.159		0.162		0.153	
	within		0.378		0.372		0.395	
Process Innovation	overall	0.34	0.475	0.36	0.480	0.32	0.468	0.1947
	between		0.354		0.352		0.367	
	within		0.318		0.327		0.292	
Log of age	overall	2.51	0.919	2.55	0.907	2.40	0.944	0.0121
	between		0.988		0.965		1.034	
	within		0.136		0.132		0.145	
Log of asset	overall	6.38	5.571	6.72	5.782	6.11	4.891	0.0732
	between		5.575		5.789		4.905	
	within		0		0		0	
FDI	overall	0.14	0.342	0.17	0.379	0.04	0.198	0.000
	between		0.343		0.379		0.198	
	within		0		0		0	
Sector	overall	0.82	0.382	0.82	0.387	0.84	0.369	0.3732
	between		0.383		0.388		0.3705	
	within		0		0		0	

Note: Firm Sample = 421

4.7 Conclusion

The data utilized for the thesis' econometric analysis were covered in this section. The information comes from a survey of service and manufacturing businesses conducted by the Department of Economics at the University of Ghana in conjunction with the Swiss Programme for Research on Global Issues for Development and the World Trade Institute at Bern for the project "Employment Effects of Different Development Policy Instruments in Ghana." The information comes from a nationwide representative sample of businesses that are registered with the National Board for Small-Scale Industries and the Association of Ghana Industries. In all, 428 businesses responded during the first phase of the data collection, while 364 businesses responded during the second. Generally speaking, majority of the companies surveyed were small businesses with a predominance in Greater Accra and Ashanti. Additionally, the majority of the businesses were manufacturing-related, locally owned, and registered as limited liability corporations. At the time of the first phase of data collection, a little more than half of the enterprises were under 20 years old, and 15% of the firms had some type of foreign ownership. Over the course of the three years, almost 95% of businesses (a sample of 421 businesses) participated in product innovations, whereas 40% invested in process improvements. The final sample of 421 businesses includes 82% enterprises and the remainder (18%) are services firms.



CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

There are two primary divisions in this chapter. The results of measuring the impact of innovation on job creation in Ghanaian businesses are presented in the first section. This section looks at how innovation affects employment capacities of Ghanaian, manufacturing and service firms who operate as small, medium, and large enterprises. The gender component of the overall phenomena is covered in the second part. Here, a comparison is made between the level of employment of male-owned and female-owned innovative firms, as well as the contribution of gender to the firms' innovative behaviours.

5.2 Innovation and Job Creation in Ghana

5.2.1 Correlation

Here, the key estimate findings as well as the correlation coefficients are given. Pearson's correlation matrix, shown in Table 5.1, is used in measuring multicollinearity. This study follows Kennedy (2008) and fixes the multicollinearity limit at 0.7 which signifies a correlation between two variables; as a result, the findings shown in Table 5.1 do not demonstrate multicollinearity



Table 5. 1: Pearson's Correlation Matrix

Variables	Log of Employment	Product Innovation	Process Innovation	Log of Firm Age	Log of Asset	FDI	Union
Log of employment	1.000						
Product Innovation	0.107	1.000					
Process Innovation	0.157	0.242	1.000				
Log of Firm Age	0.258	-0.028	0.028	1.000			
Log of Asset	0.188	0.068	0.063	0.094	1.000		
FDI	0.430	0.019	0.101	0.069	0.021	1.000	
Union	0.407	0.004	0.072	0.245	0.084	0.339	1.000

5.2.2 Effect of innovation on Job Creation

Table 5.2 below reveals the results of the impact of innovation on job creation in Ghanaian manufacturing and service firms using the Fixed effect first difference regression model for Change in employment. The results inform that innovation in product and process does not significantly add to the number of jobs already in existence. Thus, there is no difference between the number of jobs that were available between 2013 and 2015 at the firm level according to the panel data used in this study. However, this result does not necessarily mean that innovation has no impact on the levels of employment.

Table 5.3 below summarizes the findings of regression in employment (the number of people in a firm) on product and process innovation, taking into account other firms' and industry characteristics. The first column presents the whole random effects estimator model, while the second and third columns present the complete fixed effects model with the full Hausman test findings supporting the usage of the fixed effects illustrated in table 5.4. The results from Table 5.4 indicates that there is multicollinearity as the p-value is significant at 5% significance level

hence the fixed effect is preferred because it addresses the issue of multicollinearity making the results unbiased. The fourth column reports on the Hausman-Taylor estimator.

The findings show that product innovation significantly and positively affects employment levels. On average, companies that create new products have the propensity of increasing their employment levels by 16.7% compared to their non-innovative counterparts holding other factors constant. Furthermore, the results do not change when endogeneity is addressed using the Hausman-Taylor estimator as there is a 12.7% average increase in employment in levels in firms that undertake product innovative ventures compared to the non-innovators holding other factors constant. According to Pianta (2005), evidence indicates that innovation has a generally favourable effect on employment at the firm level and firms that innovate in products experience higher levels of growth and expansion than the ones that do not innovate regardless of the industry, size or other characteristics.

The employment situation in Ghanaian businesses, however, does not appear to be much impacted by process innovation. This does not suggest that Ghanaian firms do not engage in process innovation, just that the resultant effect is neither job losses nor job creation because most of the workers remain at the post but not necessarily performing the same task. Twumasi Baffour et al. (2018) pointed out that in most cases, what is referred to as process innovation in Ghana does not involve a major change in skills/ knowledge hence there is no loss of jobs. Older firms also have a high possibility of employing more workers same as firms with a higher level of assets.

The findings show that product innovation significantly boosts employment. The possible reason for this positive correlation is product innovative firms expanding their market resulting from the increase in demand for the new product. Generally, the results support recent findings on how innovation (Process and Product innovation) affects employment levels even though these studies

are focused on developed countries (Zimmermann, 2009; Harrison et al. 2014). Zimmermann (2009) realized a positive impact of innovation both in process and product on employment while Harrison et al. (2014) found that the primary factor influencing employment levels was an increase in the demand for new products.

Table 5. 2: *Impact of innovation on job creation, fixed effect model (First Difference Regression model).*

Variables	Fixed effects
Product Innovation	0.127 (0.085)
Process Innovation	0.001 (0.045)
Female	0.000 (0.000)
Log of firm age	0.307 (0.236)
Log of Asset	0.000 (0.000)
FDI	0.000 (0.000)
Unions	0.000 (0.000)
Sector	0.000 (0.000)
Constant	-0.038 (0.033)
Observations	717
Number of firms	403

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

Table 5. 3: Determinants of employment.

Variables	1		2	Hausman Taylor
	Random effects	Fixed effects	Fixed effects	
Product Innovation	0.139* (0.079)	0.167*** (0.062)	0.129 (0.081)	0.127** (0.064)
Process Innovation	0.034 (0.048)	-0.007 (0.049)	0.001 (0.050)	0.002 (0.047)
Female	-0.714*** (0.119)			-0.709*** (0.130)
Log of firm age	0.284*** (0.054)	0.082 (0.154)	0.119 (0.184)	0.272*** (0.057)
Log of assets	0.030*** (0.011)			0.031*** (0.011)
FDI	1.457*** (0.193)			1.457*** (0.187)
Unions	0.956*** (0.171)			0.960*** (0.162)
Sector	-0.259* (0.138)			-0.293* (0.156)
Constant	1.797*** (0.202)	2.389*** (0.409)	2.336*** (0.466)	1.865*** (0.215)
Time effect	Yes	No	Yes	Yes
Observations	1,138	1,138	1,138	1,138
R-squared		0.020	0.021	
Number of firms	421	421	421	421
Hausman test (p-value)		13.57 (0.0036)	11.44 (0.0096)	

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



Table 5. 4: Hausman Test Results

Hausman Fixed				
Coefficients				
	(b) FE	(B) RE	(b-B) Difference	sqrt (diag (V_b-V_B S.E.
Product Innovation	0.167156	0.20899	-0.041834	0.0198814
Process Innovation	-0.0072577	0.0161558	-0.0234085	0.0147131
Log of firm age	0.081845	0.2661011	-0.1842561	0.1035121

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned}\chi^2(3) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 11.44\end{aligned}$$

Prob>chi2 = 0.0096

(V_b-V_B is not positive definite)

In table 5.5 below, the Hausman-Taylor estimator's results are replicated independently for the manufacturing and service sectors and each firm size (Small, Medium and Large). The results inform a positive and significant correlation between innovation in products and job employment in manufacturing and large firms but no statistically significant correlation between employment and small and medium-sized firms that engage in product innovation.

These findings may be explained by the fact that, in comparison to Ghana's service industries, manufacturing enterprises are characterized by product innovation that is not typically radical but rather minor enhancements to already existing commodities. On average, manufacturing firms that

undertake product innovation can increase their employment levels by 13.6% more than those that don't engage in product innovation, holding other factors constant. Based on the knowledge that workers in manufacturing firms accumulate over time, the firms still make use of them and also employ new workers resulting from the increase in demand for the novel product.

A similar thing can be said about large firms in Ghana since firms that are innovative by the introduction of novel products are the firms that have employed more labour over time and have become large. On average, large firms that innovate in products can increase their employment levels by 22.9% compared to non-innovators, holding other factors constant.



Table 5. 5: Determinants of employment Hausman–Taylor estimates only

Variables	Sector		Firm Size		
	Manufacturing	Service	Small (0-19)	Medium (20-49)	Large (50 and above)
Product Innovation	0.136* (0.070)	0.021 (0.147)	-0.028 (0.060)	-0.110 (0.067)	0.229** (0.092)
Process Innovation	0.016 (0.053)	-0.013 (0.101)	0.050 (0.042)	0.036 (0.048)	-0.013 (0.064)
Female	-0.847*** (0.146)	-0.122 (0.322)	-0.146** (0.062)	-0.011 (0.068)	-0.085 (0.249)
Log of firm age	0.237*** (0.064)	0.391*** (0.137)	0.041 (0.032)	-0.000 (0.034)	0.063 (0.111)
Log of assets	0.021* (0.012)	0.081*** (0.026)	0.012** (0.006)	0.002 (0.004)	0.008 (0.012)
FDI	1.526*** (0.205)	0.748 (0.527)	0.314** (0.128)	0.064 (0.083)	0.350* (0.182)
Unions	0.950*** (0.183)	0.995** (0.399)	0.042 (0.097)	0.056 (0.066)	0.677*** (0.197)
Sector			0.069 (0.079)	-0.039 (0.062)	0.222 (0.215)
Constant	1.741*** (0.197)	1.218*** (0.406)	2.073*** (0.124)	3.479*** (0.130)	3.857*** (0.345)
Observations	932	206	458	213	234
Number of Observations	347	74	214	105	102

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.

5.3 Gender Dimension

5.3.1 The effect of male and female-owned Innovative firms on Employment

Results of the Hausman-Taylor estimator for the overall sample of 421 enterprises are shown in Table 5.6 below when process and product innovation interacted with female. The findings show that, when other factors are held constant, female-owned firms that innovate in products see an average decrease in employment levels by 1.3% relative to their non-innovating counterparts, while male-owned firms that innovate in products see an average employment level increase of 20.1% relative to non-innovators. How these results are calculated is in Table 2 of the appendix. Same approach is used to calculate all the results with interaction terms. Gender has no statistically significant impact on the employment levels of firms when it comes to process innovation.

Table 5.7 below gives us the results of the Hausman Taylor Estimator when both process and product innovation interacted with female dummy by industry (manufacturing and service) and size of firms (small, medium and large). The findings show that male and female-owned firms in the manufacturing sector that undertake product innovative ventures have a substantial (1% significance level) influence on employment, however, the direction of the effects differs between male and female-owned firms.

The results indicate that on average, female-owned firms that undertake product innovation in the manufacturing sector experience a decrease in employment by 6.1% compared to their counterparts who do not innovate holding other factors constant. Contrarily, male firms with a history of product innovation tend to increase their employment levels by an average of 24.4%, while controlling for other variables. This is consistent with the findings of Horst and Lachenmaier (2010). The study clarified that there is a less evident effect of product innovation that might result

in job losses as well as a direct positive influence on employment that emerges from the increase in demand for the new product. When a firm introduces a new product, it will enjoy high profits resulting from the increase in demand for the newly introduced product which eventually leads to an increase in labour demand which is consistent with the outcome below in the case of manufacturing firms that are owned by men. However, this is only in the short run because the firm does not face any competition. With time other firms can also introduce either similar or better products to create some level of competition. The firms' inability to cope with the competition can lead to lower levels of profit and this can negatively impact their level of employment which is also consistent with this study's findings in the case of female-owned manufacturing firms. Another possible explanation in the case of manufacturing firms that are owned by women is the concept of entrepreneur orientation of male and female entrepreneurs (Miller, 1983). According to Miller (1983), competitive aggressiveness is a key feature of an entrepreneur and males are generally considered to be more aggressive when it comes to competition than their female counterparts. Both males and females can innovate but when it comes to competition, the males are ahead of the females. It can therefore be inferred from this concept that there won't be any job losses in male-owned manufacturing firms since male entrepreneurs can easily handle any competition from other businesses, even if they want to launch a comparable product. The same cannot be true of female business owners, who can have a little difficulty than their male counterparts to pursue their industry rivals aggressively, which increases the likelihood of job losses. Also, if the newly released product is simply a replacement for the old one, the outcome won't be obvious. The old employees can simply be replaced by the new ones in this scenario. However, if the production of the new product needs less labour than the old product, there may even be a reduction in the number of employees.

Male and female product innovative firms do not seem to have any significant effect on service firms in Ghana possibly because the manufacturing firms in Ghana are characterized by product innovation compared to the service firms. Also, most of the firms according to the data used in this study are manufacturing firms.

In the case of process innovation, male and female process innovative firms do not have any significant effect on the employment levels of both manufacturing and service as well as small and medium-sized firms. Possibly because what is termed process innovation in Ghana does not involve any major change in the production process hence most of the workers retain their jobs because of the experience they have gathered over time. However male and female process innovative firms have a significant effect on employment in Ghanaian large firms even though the direction of these effects differs between male and female-owned firms. On average, females process innovative large firms in Ghana record a 36.9% decline in their level of employment than those that do not engage in process innovation holding other factors constant. Male-owned process innovative large firms in Ghana on the other hand have the propensity of increasing their employment level by 5.2% on average, more than the non-process innovators holding other factors constant.

This result is consistent with findings from earlier studies by Lachenmaier and Rottmann (2011), Hall et al. (2008), and Zimmerman (1991). The studies explained that process innovation has a labour-saving effect which negatively impacts employment levels and this is the case of female-owned Ghanaian large firms. The studies further indicated that process innovation leads to a more efficient way of production which reduces the firm's cost of production. The reduced cost of production can easily be passed on to customers in the form of reduced prices for the product which can stimulate a high demand for the product. An increase in demand for the product will

require the firm to increase its production capacity which can lead to an increase in employment all over again. In the case of male-owned process innovative large firms, the compensation effect is huge enough to offset the initial labour-saving effect leading to an increase in employment of 5.2% which confirms the findings of Rupert Harrison et al. (2005) that the compensation effect of process innovation outweighs the job displacement effect. But for the female-owned firms, the narrative is different as we can see a 36.9% decline in employment levels. This is an indication that the female-owned large firms are probably not able to increase their level of production which will require more labour after the initial direct labour-saving effect of process innovation.

A possible explanation can be the capital-intensive nature of process innovation. The resource dependency theory talks about the availability of resources for entrepreneurs. According to Becker-Blease and Sohl (2007), in economies that are institutionally strong and economically advanced, women seek finance at a lesser rate than men but also stand an equal chance of getting investments. This is not the case for Ghana which is not very advanced economically. Estrin and Mickiewicz (2011) posit that female-owned firms are disadvantaged in terms of their access to finance in countries with weak institutions and corruption. This implies that the resources, both financial and non-financial that the female firms will require to be able to increase their employment all over again after the initial labour-saving effect of process innovation are not at their disposal. Also, as indicated by the World Bank Group and the International Finance Corporation (IFC) (2014), the limited business skills as well as the social and cultural responsibilities placed on female entrepreneurs are a challenge. The reduced cost of production resulting from process innovation in female-owned firms can lead to high levels of profit but a certain level of business skills is required to be able to expand the business which can lead to employment all over again. Relative to their male counterparts, Ghanaian female entrepreneurs

may struggle with maintaining and tracking accounts, managing taxes, and comprehending compliance laws and regulations due to the apparent challenges they face. Additionally, they may not be able to develop a long-term strategy with a strategic focus on certain markets.

Table 5. 6: *Determinants of employment, Hausman-Taylor estimator with interaction terms*

Variables	Hausman-Taylor
Product Innovation	0.201*** (0.069)
Process Innovation	-0.007 (0.054)
Gender	-0.571*** (0.149)
(Product Innovation) *Female	-0.214** (0.085)
(Process Innovation) *Female	0.091 (0.103)
Log of firm age	0.273*** (0.057)
Log of Assets	0.031*** (0.011)
FDI	1.450*** (0.187)
Union	0.960*** (0.163)
Sector	-0.295* (0.157)
Constant	1.809*** (0.216)
Observations	1,138
Number of firms	421

Standard errors in parentheses

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

Table 5. 7: Determinants of employment, Hausman-Taylor estimator with interaction variables by sector and firm size

Variables	Sector		Firm Size		
	Manufacturing	Service	Small (0-19)	Medium (20-49)	Large (50 and above)
Product innovation	0.244*** (0.077)	0.007 (0.157)	0.022 (0.067)	-0.124* (0.066)	0.209** (0.094)
Process innovation	0.018 (0.059)	-0.081 (0.124)	0.061 (0.051)	0.013 (0.047)	0.052 (0.068)
Gender	-0.621*** (0.166)	-0.325 (0.372)	-0.026 (0.090)	-0.219 (0.159)	0.038 (0.284)
(Product innovation) * Female	-0.305*** (0.095)	0.179 (0.185)	-0.119 (0.080)	0.132 (0.131)	0.074 (0.192)
(Process innovation) * Female	0.043 (0.117)	0.193 (0.214)	-0.070 (0.082)	0.180 (0.110)	-0.426** (0.177)
Log of firm age	0.233*** (0.064)	0.357** (0.142)	0.044 (0.032)	-0.002 (0.037)	0.058 (0.111)
Log of firm asset	0.020* (0.012)	0.080*** (0.028)	0.013** (0.006)	0.001 (0.005)	0.007 (0.012)
FDI	1.515*** (0.205)	0.724 (0.552)	0.317** (0.127)	0.055 (0.089)	0.363** (0.181)
Union	0.954*** (0.183)	1.007** (0.418)	0.046 (0.097)	0.042 (0.071)	0.669*** (0.196)
Sector			0.074 (0.079)	-0.031 (0.066)	0.193 (0.214)
Constant	1.661*** (0.198)	1.311*** (0.424)	2.016*** (0.126)	3.502*** (0.136)	3.892*** (0.345)
Time effects	Yes	Yes	Yes	Yes	Yes
Observations	932	206	458	213	234
Number of firms	347	74	214	105	102

Standard errors in parentheses

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

5.3.2 Influence of Gender on the Innovative Behaviour of a Firm

Table 5.7 below displays the results of the probit test to determine the role of gender in the innovative (Product and process innovation) behaviour of Ghanaian manufacturing and service firms. The results indicate that gender has no statistically significant effect on the innovative behaviour of firms in Ghana. This means that gender does not play any role in the firm's decision to innovate indicating that innovation is gender-neutral in the case of Ghanaian manufacturing and service firms.

Table 5. 8: Determinants of innovation-Probit model

Variables	Probit Model	
	Product innovation	Process Innovation
Female	-0.101 (0.089)	-0.047 (0.084)
Log of firm age	-0.069 (0.045)	0.005 (0.042)
Log of asset	0.020*** (0.007)	0.012* (0.007)
FDI	0.038 (0.128)	0.326*** (0.114)
Union	0.038 (0.112)	0.086 (0.101)
Manufacturing	0.142 (0.103)	0.141 (0.099)
Constant	0.713*** (0.149)	-0.633*** (0.139)
Observations	1,242	1,242

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

These results are consistent with earlier findings by others who are of the view that innovation may not be gender-biased but rather gender-neutral (Fagerberg, 2005). It also corroborates the findings of Leitch et al. (1991). The study discovered that gender had no significant effect on the innovative behaviour of firms in Southern Indiana, States.

A possible explanation for this outcome in the case of Ghanaian firms is that the innovation process focuses on output such as products, new organization or new process making the role an individual play in the whole process invincible. As a result, the gender of those that are involved in the innovative process goes unaccounted for.



CHAPTER SIX

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Summary

This study was conducted to investigate the ambiguity that arises from the impact of innovation on job creation. While some argue that innovation, both process and product innovation lead to employment generation at the firm level, others also posit that innovation hurts job creation. This study also sought to determine the extent to which the gender of firm ownership either affects employment abilities or innovative behaviour. In this pursuit, three principal research questions were addressed, they are:

1. To what extent does the type of innovation of a firm influence its levels of employment?
2. Is gender a key determinant of innovation at the firm level in Ghana?
3. Do male-owned innovative firms employ more labour than female-owned innovative firms?

The data used for this study is obtained from an enterprise survey of manufacturing and service firms in Ghana. The survey was conducted by the Department of Economics at the University of Ghana in collaboration with the Swiss Programme for Research on Global Issues for Development and the World Trade Institute at Bern for the project "Employment Effects of Different Development Policy Instruments in Ghana."

A panel fixed effect was used to look at how innovation in product and process affects employment at the firm level. The Hausman-Taylor estimator was used to deal with issues of endogeneity because most of the variables are time-invariant. The probit regression model is used to ascertain the extent to which the gender of firm ownership affects its innovative behaviour and the Fixed

effect first difference regression model for Change in employment is used to determine the impact of innovation on job creation.

The results demonstrate that innovation in product and process has no significant effect on the creation of new jobs. However, product innovation has a positive significant impact on employment. The relationship between process innovation and employment level, however, was not immediately apparent. Additionally, employment levels were positively and significantly impacted by male-owned manufacturing product innovative firms. There was an inverse relationship between employment levels and female-owned product innovation firms. For small, medium, and large businesses, process innovation in large businesses owned by males had a substantial positive impact on employment levels, whereas, in large businesses owned by women, there was a negative relationship between process innovation and employment. The probit regression model showed that gender had no statistically significant impact on firms' innovative behaviour indicating that innovation in Ghanaian Manufacturing and service firms is gender neutral.

6.2 Conclusion

For most industrialized nations, investing more in innovation is becoming a primary priority in achieving market success and generating new employment prospects. Recent additions to the innovation literature argue that innovation and the innovation process are 'gendered.' The link between gender and innovation, on the other hand, is complex (Oko'n-Horody'nska et al. 2016) and remains understudied in the innovation literature (Alsos et al. 2013; Oko'n-Horody'nska et al. 2016). Although gender and innovation have both recently gained attention, there is currently little empirical research on how gender disparities impact the innovativeness and employment success of Micro, Small, and Medium-scaled Enterprises (MSMEs). This research closes the information

gap by illuminating and providing an understanding of the link between gender, product innovation, process innovation, job creation and employment of manufacturing and service firms in Ghana.

The findings provide useful information regarding the firm-level interactions between, employment and innovation in Ghana's manufacturing and service enterprises. For a variety of reasons, the connection between innovation and employment is a major topic in policy and research. At the initial stage it influences how various agents at the company level reject or stimulate innovation. It also offers incentives for managers and employees to decide the sort of innovation implemented, as well as the associated output, pricing, and employment implications. As a result, there is a need to understand this link at the firm level to influence innovation policy. To investigate the effects of product and process innovations on employment at the firm level, a panel fixed effect estimation model is used. Because majority of the relevant variables are time-invariant and there is a suspicion of endogeneity, the Hausman-Taylor estimator with the random effect model as a robustness check is used. To determine whether the gender of firm ownership has any influence on the innovative behaviour of the firm, the study implores a probit regression model.

Using the Fixed effect first difference regression model for Change in employment, the results indicated that innovation both in process and product has no significant effect on the creation of new jobs. Other findings show that product innovation has a positive relationship with employment. However, there is no obvious connection between process innovation and employment. Also, male-owned manufacturing firms that engage in product innovation have a positive significant effect on employment levels. There is however a negative relationship between female-owned product innovative firms and employment levels. In the case of small, medium and

large firms, male-owned process innovative large firms have a positive significant effect on employment levels but female-owned large firms show a negative association between process innovation and employment. The probit regression model revealed that gender has no statistically significant effect on the innovative behaviour of firms in Ghana hence innovation is gender-neutral in Ghanaian manufacturing and service firms.

6.3 Policy Recommendations

The research's findings are illuminating. Innovation must be acknowledged as the key to employment development in Ghanaian businesses, especially by economic policymakers. According to the findings, it is crucial to concentrate on the beneficial impacts of product innovation on employment when formulating suitable policies to support enterprises' innovative capacities as a panacea to address Ghana's persistent unemployment.

It is also very important to note that policies that will create an even playing field for male and female entrepreneurs cannot be overemphasized. As indicated by the Liberal Feminist (LF) that men only do better than their female counterparts because they are exposed to a higher level of education, resources-financial and non-financial, markets and credit among others (McMahon, 2005) and this is evident in female-owned manufacturing and large firms in Ghana. Women can contribute immensely to economic growth and development if they have the right policies backing them. The following recommendations can help mitigate some of the challenges female entrepreneurs face in business:

- First, there is a need for further research on female-owned businesses to identify the true issues that these businesswomen face. By doing this, it will no longer be necessary to create policies that are universally applicable to a range of issues.

- Second, support should be made available to women during the stage of developing business ideas as well as training programmes to help them launch their businesses. This will give women the skills they need to launch their businesses, which is critical to their survival in the early stages of their business when the likelihood of failure is so high.
- Create a training programme that is specifically aimed at women who are running micro businesses, with a focus on marketing, management, and the fundamentals of finance.
- Along with specialized technical and vocational education and training, there is also a need to ensure that credit facilities and other financial incentives (subsidies, interest-free credit, and so on) are easily accessible to women.
- The government should increase women's access to labour-saving equipment by establishing plant pools in areas and communities where they will be easier for them to reach. This will benefit women farmers and business owners in particular.
- Government and other development partners must support initiatives that advance technology transfer in all areas of economic activity to introduce Ghanaian businesspeople and women to new equipment and production techniques that will increase productivity.
- Access to sensitive corporate information and technology could be increased further by enhancing rural telecommunications and Internet connections to assist majority of women who find themselves in those places. In this situation, the government's effort to provide telephone and energy services to rural communities must be expanded.
- Supporting citizen-led start-up initiatives, enabling talented entrepreneurs to launch their own businesses, and offering low- or even no-interest loans to those with good ideas can all help create these new jobs.

- To create jobs, Ghana will need to drive sectoral transformation through the movement of workers into higher productivity firms and sectors and spatial transformation through trade, urbanization, and connectivity



APPENDIX

Table 1: Definition of variables

Variable	Definition
Labour demand	This is defined as the number of jobs available (a headcount of number of employees in the firm)
Product Innovation	Dummy variable with a value of one if a company has launched a new or considerably upgraded item or service in the corresponding year and zero otherwise.
Process Innovation	Dummy variable having a value of one if the company launched any new or considerably better methods of manufacturing or providing services in the subsequent year without altering its product/service and a value of zero otherwise.
Firm age	The age of the company is calculated in years as the difference between the current year and the year the company purports to have begun operations.
FDI	Dummy variable that indicates the presence of a foreign partner or a foreign parent company
Value of assets	The total market value of the assets the firm owns.
Unions	This is a dummy variable that take the value of one if the firm belongs to any trade union and the value of zero if the firm does not
Sector	This is a dummy variable that take the value of one if the firm is a manufacturing firm and zero if the firm is a service firm
Female	This is a dummy variable that takes the value of one if the owner of the firm is a female and the value of zero if the owner of the firm is a male.
Job creation	This is the number of new jobs that have been created but did not exist before

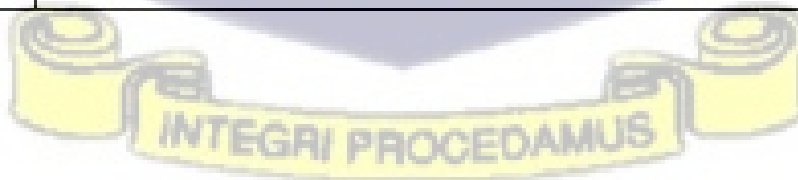


Table 2: Calculation of results of interaction terms

$$\ln L_{it} = \delta_0 + \delta_1 PD_{it} + \delta_2 Female_{it} + \delta_3 (PD_{it} * Female_{it}) + \delta_4 Age_{it} + \delta_5 Asset_{it} + \delta_6 FDI_{it} + \delta_7 Union_{it} + \delta_8 Sector_{it} + U_{it} \dots\dots\dots (3)$$

To determine the effect of female-owned innovative firms on employment, equation 3 takes the following form

$$\ln L_{it} = 1.809 + 0.201 PD_{it} - 0.571 Female_{it} - 0.214 (PD_{it} * Female_{it}) + 0.273 Age_{it} + 0.031 Asset_{it} + 1.450 FDI_{it} + 0.760 Union_{it} - 0.295 Sector_{it} + U_{it} \dots\dots\dots (3)$$

All the coefficients are gotten from table 5.6.

Now equation 3 is differentiated with respect to Product innovation (PD_{it}) and the result is as follows

$$\frac{d \ln L_{it}}{d PD_{it}} = 0.201 - 0.214 (Female_{it}) \dots\dots\dots (4)$$

Now female is a dummy that takes the value of 1 when the firm owner is a female and the value of 0 if the owner is a male, hence substituting 1 and 0 into equation 4 in turns reveals that female product innovative firms reduces employment levels by 0.013 which is 1.3% and male product innovative firms increases employment levels by 0.201 which is 20.1%.

This is how all the results of tables with interactions variables are calculated



Table 3: Summary of Product Innovation

Gender	Mean	Std. Dev.	Freq.
0	0.79234973	0.40584683	915
1	0.76693767	0.42335564	369
Total	0.78504673	0.41094998	1,284

Table 4: Analysis of Variance for product innovation

Source	SS	df	MS	F	Prob > F
Between groups	0.169809542	1	0.16981	1.01	0.3162
Within groups	216.503088	1282	0.168879		
Total	216.672897	1283	0.16888		
Bartlett's test for equal variances: $\chi^2(1) = 0.9462$ Prob> $\chi^2 = 0.331$					

Table 5: Post Hoc Pairwise comparisons of means with equal variances over Gender (One-way ANOVA)

note: option Tukey ignored since there is only one comparison

Product Innovation	Contrast	Std. Err.	t	Unadjusted P>t	Unadjusted [95% Conf. Interval]
Gender					
1 vs 0	-0.02541	0.025342	-1.00	0.316	-.0751291 .024305

Table 6: Summary of Process Innovation

Gender	Mean	Std. Dev.	Freq.
0	0.36065574	0.48045339	915
1	0.32249322	0.46806524	369
Total	0.34968847	47705732	1,284

Table 7: Analysis of Variance for Process innovation

Source	SS	df	MS	F	Prob > F
Between groups	0.382962599	1	0.382962599	1.68	0.1947
Within groups	291.606913	1282	0.22746249		
Total	291.989875	1283	0.227583691		
Bartlett's test for equal variances: $\chi^2(1) = 0.3550$ Prob> $\chi^2 = 0.551$					

Table 8: Post Hoc Pairwise comparisons of means with equal variances over Gender (One-way ANOVA)

note: option Tukey ignored since there is only one comparison

Product Innovation	Contrast	Std. Err.	t	Unadjusted P>t	Unadjusted [95% Conf. Interval]
Gender					
1 vs 0	-0.03816	0.0294113	-1.30	0.195	-.095862 .019537

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