The Impact of Access to Finance on firm's growth and Innovation: Evidence from Ethiopia

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AUTHOR'S DECLARATION

I the undersigned, declare that this thesis is entitled ***The Impact of Access to Finance on firm's Growth and Innovation: Evidence from Ethiopia.*** It is my original work that it has not been submitted to any other institution anywhere for the award of any other academic degree. I followed all ethical and technical principles of scholarship in the data collection, data analysis and preparation of this report and all the sources that I have used or quoted have been indicated and acknowledged.

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LIST OF ACRONYMS AND ABBREVIATIONS

WBES-World Bank Enterprise Survey

OLS-Ordinary List Square

TPP-Technological product and process

SME-Small and Medium enterprise

ES-Enterprise survey

SNNPR-Southern Nation Nationality People Regions

It-Information Technology

OD-Overdraft facility

CL-Line of credit

FIN_CON-Finance Constraints

FIN_OBS-Obstacles Finance

R & D-Research and Development

VIF-Variance inflation Factor

LR-Likelihood ration

MSE-Mean squired error

ANOVA-Analysis of variance

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Abstract

The main objective of this study is to investigate the impact of access to finance on innovation and growth and to examine the effect of innovation on firms growth in Ethiopia. The study used the survey data that come from the 2015 World Bank Enterprise Survey (WBES) for Ethiopia. The 2015 WBES is the latest available survey data that covered three years ranging from 2012 to 2014. The WBES used standardizes global methodology in determining sample size and conducting the survey. A total of 567 observation that satisfy the selection criterion are actually included in this study.

Quantitative research approach and explanatory research design was used. Probit regression model was used to investigate the impact of access to finance on firm's innovation. The Ordinary List Square (OLS) regression mode was used to examine the effect of access to finance and innovation on firm's growth in Ethiopia. Stata version 14 was used to analyze the data and estimate the models. The result from the probit regression analysis I found that firms that have access to finance measured using four indicators are more likely to innovate than those who do not have access to finance. Firms who also invest in R & D are more likely to innovate. From the OLS regression, result I found that using improved products or process have significant positive impact on firm's growth and similarly firms with better access to finance exhibit better growth. The result further shows that on average 48% of sampled firms has introduced Technological product and process (TPP) in the last three years of the survey. In addition to this, 70.3% of the firm in Ethiopia encountered financial constraints.

Key words: *Access to finance, Technological product and process, Innovation, Firm growth.*

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CHAPTER ONE

1. Introduction

1.1 Background of the Study

Economists have identified innovation and technological progress as the main drivers of growth and productivity (Landes, 1969; Rosenberg, 1982; Solow, 1957; Griliches, 1979; Wakelin, 2001; Tsai and Wang, 2004; Ortega Argilés et al., 2008). But the nature of innovation in developing markets is quite different from the technology-driven product and process innovations of industrial countries (see e.g., Sharma and Jha, 2016). These unique innovation activities are focused on imitation of developed market production processes (Iyer et al., 2006), technology cobbling (Sharma and Iyer, 2002), and a blend of imitation and innovation (Segerstorm, 1991; Shenkor, 2010). As argued by Acemoglu et al. (2006) and Dutz (2007) that developing economies gain more from the absorption and diffusion of current knowledge that implies the application of existing technologies, practices and processes in new settings and product domains, than attempting to push outward the global technological frontier of knowledge.

Considering the overwhelming evidence of technological advancement for economic growth and development, it is imperative to examine how access to finance is related to the innovation-growth nexus since external capital is critical for firm activities. Innovation projects have several peculiar characteristics compared to other investment projects. These features could create difficulties in gaining access to external finance under the classical view of information asymmetry and agency costs. First, investments in innovation activities are highly risky since returns from such investments are long-term and uncertain (Madrid-Guijarro, Lema and Auken, 2015; Carreira and Silva, 2010).

This uncertainty is particularly higher during the initial stages of innovation projects. Firms are also reluctant to disclose full information about innovation projects to protect their

proprietary rights (Anton and Yao, 2002), hence, further exacerbating the information asymmetries. Second, innovation investments develop specific intangible asset and knowledge base, created by investment in human capital through worker training in new technologies and processes, and knowledge creation through design and marketing investments (Hall, 2010). All this distinctive intangible capital is firm-specific, fixed in human capital, and has a limited marketability and collateral value (Mina et al., 2013).

Third, lenders may lack the required skill set to evaluate projects, which may typically be characterized by specific technical or scientific knowledge. This may further exacerbate the moral hazard problem given that lenders lack complete information, and understanding, of the signals about the nature of innovation investment value propositions (Mina et al., 2013).

All these features can substantially escalate the cost of external capital (Carpenter and Petersen, 2002; De-Meza, 2002), which may subject innovation investments to the credit constraints. Innovation at the firm level that includes, besides core innovations namely new products, services, processes, or new technologies, but other activities such as new logistical and distribution processes, and new organizational structures and practices. As argued by Ayyagri et al. (2015) and several other studies, that firms in the developing markets have several avenues to innovate. This view largely stems from the Kremer's (1993) O-ring theory of development that these activities by the firm are complementary to each other; help promote knowledge transfers and increase firm's abilities to adapt to their peculiar environmental conditions. Hence, this "new-to-firm innovation" measure is more relevant to the nature of firms in the developing economies than the more radical innovations of new global technologies in advanced economies. Therefore, this paper aims to explore the effects of access to finance on firm's growth and innovation in Ethiopia.

1.2. Statement of the Problem

In recent years, formal and informal innovation is developing, and we are observing mass political determination across the globe to temporary innovation and related policies on the ground (GII, 2019). Technological advantages want to keep their superior position in technological leadership, while technologically lagged countries want to catch-up the frontiers and share the advantage of technological competitiveness. Despite, the increasing demand and commitment to innovate, there are several key practical problems in the subject that needed a solution, particularly from the perspectives of Ethiopia.

Firstly, African countries in general and Ethiopia in particular are characterized by low productivity, prolonged poverty, and slow economic development, in the region, investment in innovation remains lower compared with other regions of the world. According to the 2016 World Bank report, the average poverty rate in Ethiopia is about 24% while it is below 13% global average in the same year. Similarly, the 2019 GII report indicates that the Ethiopia competitiveness rank from 140 countries is decrease from 109th in 2016 to 126th in 2019. In contrast, neighbor countries such as Kenya (95th) and Rwanda (100th) shown a remarkable improvement in the global competitiveness index. Generally, Ethiopia remains technologically lagged and achieving economic development through innovation is remain a hard task (GII, 2019).

Second, access to finance is remain the key problem in developing country's innovation process and, it also remains the core concern of researchers, policy makers and business leaders. In this regard, African countries in general are severely disadvantaged from financial development, and financing constraint is the most binding constraint for firms' growth (Beck and Cull 2014, Ayalew and Xianzhi 2019). Financing constraint in the region is twice higher than non-African countries, and only about 23 per cent of firms use bank loans (Otchere, Senbet et al. 2017). In Ethiopia, the level of financial constraints is worse than even compared with other African countries. For instance, Ayalew and Xianzhi (2019) reported, in Ethiopia, about 44% of firms face financial constraints which higher 36% and 42% of East Africa and Africa average, respectively. In Ethiopia, the financial sector is opaque, underdeveloped, and bank-based which adversely affect the firm's access to external finance to fund their

innovative projects. However, we know very little how and to what extent lack of access to external finance affect innovation.

Empirical results show that firm's general access to finance has a positive impact on various forms of innovation activities. In particular, bank financing is positively related to the introduction of new product lines and process innovations as well as to other soft forms such as organizational and marketing innovations. The existence of financial constraints adversely affects the innovation performance and firms growth.

While there is a growing body of literature that has identified conditions that promote firm innovation and growth in industrial countries, (see e.g., Hall et al., 2009; Hall, 2011), but little is known on how firms in the developing markets, such as in Ethiopia. Further, most of the studies pertain to large firms in the industrial countries. It is not clear whether such knowledge is applicable to developing economies where firms face rather different operating. environment, and the nature of innovation is likely to be quite different since these firms are far from technological frontier.

The literature on firm innovation, pertaining mostly to the large publicly traded firms in industrial countries. It has limited implications for developing countries where innovation activities are a blend of imitation and innovation through the adoption and diffusion of new technologies, new means of production processes, products, and organizational arrangements.

In the Ethiopian context, enterprise survey conducted by world bank (2015) identified couple of obstacles in the business environment. This including access to finance, infrastructure (electricity and transport), government regulation (tax rate and administration, custom regulation etc.) and corruption were prominent. More specifically, the study pointed out access to finance as a major obstacle stood out from the list. Despite the fact that various literatures attempt to study the firm's innovativeness, there are limited, or no studies are found so far specifically with an objective of assessing the effect of limited or no access of finance to firm's innovation. Thus, this study is specifically deal with impact of access to finance in impacting firm's innovation growth in Ethiopia.

1.3. Research Objectives

1.3.1 General objectives

The overall objective of the study is to examine the effect of access to finance on innovation and firm growth and to investigate the impact of technological innovation on firm's growth in Ethiopia.

1.3.2. Specific objectives

This study has the following specific objectives which are drawn based on the above objectives.

1. To examine the effect of access to finance firm's innovation performance.
2. To investigate the impact of access to finance on firm's growth.
3. To examine the impact of technological innovation on firm's growth.

1.4Research Hypotheses

Since our study use quantitative approach, the research questions and objectives represent the cause-and-effect relationships, the comparison between variables or relationship between variables. The research hypothesis was formulated as follows:

Hypothesis 1 (H1): - Firms that have may access to finance are more likely to innovate than those who do not have.

Hypothesis 2 (H2): - Access to finance of firm's have a statistically significant positive impact on firm's growth in Ethiopia.

Hypothesis 3 (H3): - There is a statistically significant positive relationship between firm's innovation performance and growth.

1.5 Significance of the study

The purpose of the study is to assess the effects of access to finance on firm's innovation and growth in Ethiopia. Thus, this study has the following significant contributions.

- The finding of this study will help manufacturing and service provider companies to manage their finance by identifying factors determining the improvement of technological products and process of a firm and identify which variable is the most

important so as to give more emphasis.

- The study will contribute to the regulatory body to take as an additional input for future policy making.
- The study will help to provide information for management of the companies in order to minimize the impact of factors on the finance through effective strategies.
- It will also serve as source of reference for further studies in the area of financial constraints.

1.6 Scope and limitations of the study

The scope of this study is limited to investigate the impact of access to finance on firms innovation and growth performance and to examine the effect of innovation on growth using the 2015 WBES for Ethiopia. The study has several limitations. One of the limitations of the study is the objectives are addressed from the TPP dimensions. The second limitation is the study was used survey data from the World Bank Enterprise Survey group, but survey data have a problem of containing biased data. The third limitation is the study was addressing the subject from the perspectives of SMEs. Hence, the findings will not represent firms beyond SMEs.

Lastly, since there are limited, previous studies conducted on the area, the study may encounter in the source of this study in lack of adequate information due to improper document handling by the company. Due to this it will be laborious to get the necessary and relevant information. It will be also difficult to get source documentation in organized manner. The researcher may face lack of sufficient amount of money and time and also lack of experience on doing research will be major limitation.

1.7 Organization of the study

The research will be reported by organizing in to five chapters. The first chapter focuses on the problem and its approach while the second chapter contains the review related literature. The third chapter contains research design and methodology. The fourth chapter will also contain data analysis and interpretation whereas the fifth chapter will contain summary, conclusion, and recommendations of the study.

CHAPTER TWO

Literature Review

2.1 Theoretical Review

2.1.1 Definition and classification of technological innovation

Schumpeter (1939) defined technological innovation as a new means of combining factors of production resulting from a change in inputs to produce outputs. Schumpeter regarded the process of technological innovation as sequential and central to an understanding of economic growth.

According to Jiang (2001) examines the dynamic mechanism of technological innovation activities. The work argued that the main driving force of technological innovation of enterprises consists of six important factors. These factors include the benefit drive, the market or social demand pull, the driving force of enterprise employees, the corporate image and the driving force of technological development, market competition and the driving force of government. The first four are the internal forces which make enterprises accumulate technological capability, carry on technological innovation, and rest are external which force enterprises to produce innovation behaviour. More so, through technological innovation and transformation, SMEs are opportune to transform and improve the techniques of their processing equipment, manage resources, assess environmental protection, stimulate clean production, accelerate/fast track R&D of new materials and new energy sources (Feifei and Li, 2007).

Researchers in the past decades have given much more attention on technological innovation with concise/summarizing literatures illustrating/clarifying various types of innovations based on the several surveys conducted. According to *Oslo Manual* (OECD, 2005), technological innovations are broadly classified into product and process.

Technological product innovation refers to the implementation of product that is new or significantly upgraded for its intended/planned usage that may include the integrated

technical applications, components and materials or other characteristics their-in. It integrates new knowledge or techniques, or a combination of the both existing knowledge and techniques (OECD, 2005).

Technological product innovation requires/demands the firm to be technologically inclined thereby enabling them to serve their customers well based on their capabilities. This will inspire the firm to engage in innovative activities by boosting their internal competences so as to meet the market demands. Technological product innovation will arise only when a technically knowledgeable firm is able to recognise and respond to customer necessities by developing or improving products. Danneels and Kleinschmidt (2001) opined that markets and technology are core components that bring about development of new product.

Technological process innovation is the application of a new or significantly enhanced method of production or services delivery. It includes significant changes introduce in process of production, skills involved, equipment or software that are engaged during the innovation phase (OECD, 2005). Usually, it is used to reduce unit costs of production or services delivery, to improve quality or deliver new or significantly improved products or services. They are essentially introduced into firm's production or service operations that transform the way products are being manufactured.

2.1.2 Definition and concepts of access to finance

The concept of access to finance can be defined as "availability of a supply of reasonable quality financial services at reasonable costs, where reasonable quality and reasonable cost have to be defined relative to some objective standard, with costs reflecting all pecuniary and non-pecuniary costs" (Claessens 2006). It can also be defined as the "absence of price and non-price barriers" (Demirguc-Kunt and Bek 2008).

Access to finance can be considered as blood of every firm because without finance nothing can be done. While the effect of access to finance on firm's performance become an interesting topic around the whole world, availability of finance becomes challenging issue in African countries than countries in others developing region (Fowowe, 2017). Thus, it is

one of the factors that can significantly influence the firms' activities positively as well as negatively.

Theoreticians widely argued that inadequacy of financial services leads to inequality of income and restrictions of firms' performance. Besides, in the absence of sufficient financial facilities firms are limited to take advantage of promising growth opportunities. Limited access to finance has detrimental effect on the performance of firm. Equally, firms with better access to financial resource perform well. Hence, it is the key factor for the firm performance.

Access to improved finance facilities is one form of incentives to the firm that drives its performance and realization of its potential contribution to the economy. In Ethiopia, despite the firms' contribution to the national economy through job creation and supporting development process, firms cannot achieve their objectives due to existence of different factors that affect their performance such as availability of finance facility. Thus, limited access to finance is the foremost contributor to the underperformance of firms in Ethiopia (Wolday and Gebrehiwot, 2004 cited in Fredu and Edris, 2016). Moreover, in Ethiopia to develop financial access of firm's different programs are practiced over the past years by government and non-government organizations. Despite the efforts made to close the funding gaps, many firms continue to encounter trouble in accessing finance. As described by the (Zins and Weill, 2016 cited in Tekeste and Hossein, 2020), in Ethiopia financial services penetration is still weak. This shows that firms in Ethiopia still faced difficulty in accessing better finance. To sum up, it has been established in the theoretical literature lack of access to finance severely delays the performance of the firm in Ethiopia.

2.1.1.2 Theories underline the relationship between Access to finance, innovation, and growth

2.1.1.2.1 Resource Dependency theory

Resource base theory is developed by Pfeffer and Salancik (1978). This theory is one of the important theories of business sector, as it reminds that every firm is part of something bigger. It mainly deals with how the external resources of organization influence the behavior of the organization. It also states that every firm desire resource that are necessary to their operations and helpful for their success. However, these resources are external resources and

under the control of peoples outside the environment of business firms. This means every firm are subject to the influence of immediate environment to gain those essential resources required to accomplish objectives. Literature on interdependency between business and politics documented that firms use government as the major source of external resources particularly in developing economies where weak market laws exist (Wu, Li, Ying & Chen, 2018). Thus, in order to become advantageous from access to those limited and external resources, firms enter into political connections. These connections are helpful for the firms to manage uncertainties and interdependence (Najaf, 2020).

The procurement of external resources is an important belief of both the strategic and tactical management of any company. Firms in order to acquire competitive advantage over other firms in the same industry and to get better access to scarce resource that are vital for their operations, firms are widely apply a variety of strategies. The resource base view is used to determine the strategic resource a firm can exploit to achieve sustainable competitive advantage. RDT is supported by the idea that resource is the key to organizational success and that access and control over resource is a basis of power. Because these resources are often provided by another organization, this contract creates kind of symbiotic relationship. Generally, RDT is the reliance of company on another organization or party for the resource it needs to operate. It has implication regarding the optimal division structure of organizations, recruitment of board members and employees, production strategies, contract structure, external organizational links, and many other aspects of organizational strategy.

Basic arguments for resource dependency theory are:

- Organizations depend on resources.
- These resources ultimately originate from an organization's environment.
- The environment, to a considerable extent, contains other organizations.
- The resource one organization needs are often in the hand of other organization.
- Resources are a basis of power.
- Legally independent organizations can therefore depend on each other.
- Power and resource dependence are linked directly: organization A's power over organization B equal to organization B's dependence on organization A's resource.
- Power is thus relational, situational, and potentially mutual.

Organizations depend on multidimensional resources: labor, capital, raw material etc. organization may not be able to come out with countervailing initiatives for all these multi resources. Hence organization should move through the principle of scarcity, critical resources are those the organization must have to function. An organization may adopt various countervailing strategies it may associate with more suppliers or integrate vertically or horizontally (http//:www.en.m.wikipedia.org accessed at 11-Nov-2020)

2.1.1.1.2. Information Asymmetric Theory

Information asymmetry theory assume that when two parties are making decisions or transactions, there exists a situation where when one party has more or better information than the other. Thus, information asymmetry may cause an imbalance of power between the parties. In this context, for example, the borrowers are more likely to get more information than the lenders. Information related with the risk associated with the investments is likely to be available to the borrowers. Matthews and Thompson (2008) observed that this may lead to the problems of moral hazard, where a party will take risks because they assume final cost of that risk, as well as adverse selection, where there are adverse results because parties have different/imperfect information; therefore, the problems may cause inefficiency related to the flow or transfer of funds from the lenders (surplus) to the borrowers. Furthermore, for overcoming these issues, the financial intermediaries use three major ways such as providing the commitment for long-term relationship with the clients. The second way is through the sharing of the information. Lastly is through the delegation and monitoring of the credit applicants. When the customers borrow money directly from banks, the banks should consider the need for relevant information to be addressed and so as to redress the asymmetry of the information (Matthews and Thompson, 2008).

It is argued that the acuteness of information asymmetries between bankers and entrepreneurs is the main stumbling block to SME financing in Sub-Saharan Africa. However, the gap between banks and SMEs can be narrowed by developing financial systems that are more adapted to local contexts. In addition, avenues should be explored for sharing of risks and reduction of perceived risks by banks by promoting sustainable guarantee funds to facilitate better access to financing by SMEs (Leffileur, 2009).

2.2. Review of Empirical studies and Hypotheses Development

2.2.1. Access to finance and firm innovation

Does credit access affect innovation? There are three main reasons why there may be a structural problem of access to finance for innovative small firms. First, the returns to innovation may be uncertain that make innovation riskier to finance. Only a fraction of firms tends to experience significant growth following investments in innovative activity. (Hall, 2002; Coad and Rao, 2008; Mazzucato 2013). Second, there may be information making it harder for credit to value innovative investments. The skills needed to evaluate innovative investments may be different from those for other types of SME lending and investment may be highly sector specific. One view is that SMEs require different sorts of lending focused on long-term relationships. Because those firm has more information on the potential success of innovations than the financier, in some cases the market for innovation finance has lack of information on which firms are worth financing increasing the cost of finance and reducing the probability of successful applications. Third, new innovations may be highly context specific that new process innovation may apply only within the firm in which it operates. Overall, these reasons may make it harder for innovative small firms to access finance or may access of loan provide at a higher cost. (Mina et al. 2013).

According to Agénor.et.al, (2014), finance in supporting the innovative activities that in turn can help countries climb the ladder to high-income status. In particular, this note argues that inadequate access to finance has an adverse effect on innovation. Second According to Lee.et.al, (2015), innovative firms are more likely to be turned down for finance than other firms, and this worsened significantly in the crisis. However, regressions controlling for a host of firm characteristics show that the worsening in general credit conditions has been more pronounced for non-innovative firms with the exception of absolute credit rationing which still remains more severe for innovative firms. The results suggest that there are two issues in the financial system. First, they find evidence of a structural problem which restricts access to finance for innovative firms. Second, we show a cyclical problem has been caused

by the financial crisis and impacted relatively more severely on non-innovative firms(SMEs). Third According to Ayalew el ta (2019), innovative firms, specifically innovative small- and medium-size firms exhibit financing patterns different from non-innovative peers. Further analysis indicates that there is no statistically significant difference between the financing patterns of innovative and non-innovative large firms. In Africa, innovation is mostly financed using internal sources and bank finance. Equity finance and bank finance have shown a higher effect followed by internal finance, finance from non-bank financial institutions and trade credit finance on firms' probability to innovate. So based on the above discussion the following hypothesis was formulated

2.2.2. Access to finance on firm growth

Finance and its access, it enables individual or firm to do what they desire to do is gradually being recognized as a significant aspect of economic development. Access to finance means "availability of the supply of reasonable quality financial services at reasonable costs, where reasonable quality and reasonable cost has to be defined relatives to some objectives standard with the cost reflecting all pecuniary and no pecuniary cost" (Arora, 2007). Also access to finance can be defined as`` the absence of price and non-price barriers in the use of financial services" (Demirguckunt and Maksimovic, 2006).

Aryeetey et al. (1998) maintain that because conflicts of interest between debt and equity holders are especially serious for assets that give the firm the option to undertake such growth opportunities in the future. If growth opportunities produce moral hazard situations and SMEs have an incentive to take risks to grow. Thus, the benefits of this growth will not be enjoyed by lenders who will only recover the amount of their loans, resulting in a clear agency problem. This will be reflected in increased costs of long-term debt that can be mitigated by the use of short-term debt.

Some studies focused on SMEs difficulties in accessing finance for working capital and business expansion operations. Various researchers across the world show some of the constraints that SMEs face in accessing finance to develop their operations. Growth challenges for SMEs still exist like access to finance, high borrowing costs and the requirements by lenders to ask for provision of collateral. Furthermore, when SMEs start

export to foreign markets, their contribution to their home economy increases. For this to happen, substantial barriers need to be overcome. SMEs can face difficulties in financing international activity, identifying opportunities and making appropriate contacts in their target markets (Wymenga, Spanikova, Barker, Konings & Canton, 2012).

Therefore, reducing this financing gap in low-income countries should raise the incentive to create SMEs and accordingly improve economic growth and increase job creation. In addition, improving SMEs' access to finance is significantly important in promoting performance and firm productivity. To examine how important financial exclusion is a constraint to firm growth when compared with other obstacles Which include firm characteristics to capture size of the firm, age of the firm, business regulatory conditions, corruption and country controls. The inclusion of these firm characteristics helps in controlling the results of examining the effects of access to finance constraints on the performance of African firms with related to business environment access to finance constraint has a significant negative effect on employment growth (Dinh.et.al,2012; Ayyagari et al, 2008). Since access to finance has a negative sign then inadequate financing is a serious constraint that African firms face, and which adversely affects their growth.

In order to estimate the effects of access to finance constraints on firm growth obtained from the Enterprise Surveys. The primary variable of interest is access to finance constraint, denoted that if access to finance is a constraint on firm performance, it will have a negative relation. The other constrain are firm characteristics to capture size of the firm, age of the firm, business regulatory conditions, corruption, and country controls. The firm characteristics help in controlling for the difference conditions facing firms with different characteristics, it will have positive relation. (Aterido et al., 2011) Thus the results of examining the effects of access to finance constraints on the performance of African firms imply that inadequate finance is a serious constraint on the growth of firms. The results show that access to finance constraint has a significant negative effect on employment growth. These inadequate financing is a serious constraint that African firms face, and which adversely affects their growth (Dinh et al., 2012; Ayyagari et al., 2008). The World Bank Enterprise Surveys provide a large set of business environment constraints access to finance

is an obstacle, such as use of external sources of finance, loans or line of credit outstanding, and loan applications.

Using data from recent surveys of Ethiopian firms, David Fielding.et.al., (2017) estimate the effect of a firm's access to finance on the growth of its sales and employment. Access to finance is measured by the proportion of its working capital (or fixed capital) funded from internal sources, or alternatively by a binary variable indicating whether all of its capital is funded from internal sources. The result shows a significant positive relationship between internal financing and growth: that is, firms with access to external finance grow more slowly. These effects are robust to estimation techniques that allow for the potential endogeneity of access to finance, using a town-specific measure of financial depth as an instrumental variable. Therefore, firms with access to bank finance have less growth potential than those which do not, suggesting substantial allocate inefficiency in the banking sector. One possible source of inefficiency is that loans are given to firms with the best political connections, not those with the best investment opportunities. In the absence of institutional reforms designed to ensure that bank finance is allocated to firms with the highest return to capital, incentives to promote the expansion of existing banks are unlikely to stimulate very much growth in countries like Ethiopia.

In Ethiopian, despite the enormous importance of the SME sector to the national economy with regards to job creation and the alleviation of abject poverty, many of the SMEs are unable to realize their full potential due to the existence of different factors that inhibit their growth and performance. One of the leading factors contributing to the unimpressive growth and performance of the enterprises is limited access to finance (Wolday and Gebrehiwot, 2004). In a similar way, comparing small and large firms the World Bank finds that small firms face more challenges in obtaining formal financing than large firms; they are much more likely to be rejected for loans, and less likely to have external financing (World Bank, 2015).But in Ethiopia the financing gap of SMEs and recommend ways of addressing to overcome financing gap are the financing needs and financing options of SMEs in Ethiopia, Key constraints of SMEs access to finance, extent of banks and Micro finance institution involvement with SMEs, and the drivers and obstacles of SME bank financing, and the impact of existing government policies and potential areas of government involvement

(Petersen and Rajan, 1994; Wiedmaier-Pfister.et.al.,2008; Ghimire and Abo, 2013). So finance constraint has negative effect on the growth of SMEs in Ethiopia.

First According to Lucumay Gloria (2014), The accessibility of external finance is an important factor for the different stages of growth for SMEs. Lack of management skills and poor keeping of business records acted as barriers for their growth. These can be removed if the SMEs have reliable financing sources. Furthermore the study recommends that competition is a challenge to the SMEs does not mean that business environment is not competitive. Second According to David F. Moreiraa (2016) The expected outcome of the paper is that growth of SMEs is strongly dependent on the financial access. Furthermore the author addresses the governmental decision makers with recommendations to ease the access to finance. Based on the research findings and related empirical analysis, an increase in credit accessibility supported by improved governmental European legislation for SMEs, may significantly promote the growth, wealth, and employment rates in Europe. Third According to Babajide Fowowe (2017), the results using the subjective measure show that the access to finance constraint exerts a significant negative effect on firm growth. Also, the results using the objective measure show that firms that are not credit constrained experience faster growth than firms which are credit constrained. These results lend credence to the view that financing is very important for firm growth, and justifies the many measures and initiatives being put in place to make more finance available for African firms. So based on the above discussion the following hypothesis was formulated.

2.2.3. Technological innovation on firm growth

The growth of SMEs are influenced by access to finance and technological innovation, technology defined as the technical process through which new and/or improved technologies are developed and proliferated through commercialization (Ambuj and Zwaan, 2006; Lee.et.al.,2011). Technological innovation derived from the idea of 'innovation' which is a process initiated by the perception of new market and/or new service opportunity for a technology-based invention, which leads to development, production and marketing tasks striving for the commercial success of the invention (Refer Garcia & Calantone, 2002). Most of previous literatures focus on financial measurement as the key to evaluate business

success. However, this evaluation is considered biased by scholars who believe non – financial measurements are also important to be assessed as SME Success. Then technological innovation is an important means to stimulate economic efficiency of SMEs and a source to attain a sustainable development, (Bala-Subrahmanya.et.al.,2010). Essentially, if the SMEs must adjust to the changing external environment and meet market needs, they must take technological innovation as the basic technique to growth (Bala-Subrahmanya, 2012). In fact, the advanced development and growth of most successful SMEs is depending on continued technological innovation (Sun, 2009).

Further, technology also had been placed as one way to practice innovation in business. The study, innovation is divided into four main types which are innovation in terms of product, process, market and organizational. Each of these types relies on technology as medium to innovate both through the social networking, free access to information via internet and also machines or technology tools in business operation. Overall, the researchers agreed that growth, success and firms' survival are depending on the firm's ability to innovate on a continual basis. So, technology and innovation started to be center of interest for professional researcher for sustainability of SMEs. Currently, references are been tailor made to match the role that entrepreneurs should play in stimulating innovation which proposed the existence of a strong connection between innovation and entrepreneurial activity (Zhou, Tan & Uhlaner, 2007; Littunen, 2010).

According to Tucker (2008) argues that innovation is the best way for stimulating growth in a firm. The most innovative firms realize higher turnover of products and services introduced within a period. In order for firms to grow, then they have to adopt an innovative approach that will enable them to gain a competitive edge in the prevailing business environment. So many scholars have conducted studies in the area of innovation like factors Influencing Innovation and effect of Innovation on the growth of financial institutions. (Gitonga,2003; Mwangi, 2007). But now scholars started investigation the concept of technological innovation on the growth of SMEs.

According to Chinazor Franca.et.al., (2018), Growth can be attributed to an increase in factors of production, improvements in the efficient allocation across economic activities,

knowledge and rate of innovation. Innovativeness is considered as one of the critical issues in the firm growth. The dimension of business growth used in this study includes: employment growth, sale growth, firm size growth and market share growth. The relationship between innovation and firm growth, innovation has a positive impact on firm growth. The study has been able to create knowledge profiles to distinguish between product-oriented innovativeness and process-oriented innovativeness. From the analysis conducted, comparing the two, the study finds that small scale firms with high technical competence should be able to improve product shapes/dimensions, increase the range of products and as a result increase the share of innovated product in their total sales, which contribute to the growth of the employment, sales, firm size and market shares. However, the result indicate that product-oriented innovativeness has more impacts than the process-oriented innovativeness.Therefore, it should be stressed that innovation growth effects are particularly important for manufacturing firms.The result of this research is very important to government policymakers aiming at full employment and economic growth. The policies should encourage innovation among especially SMEs to involve in new product creation, to strengthen the employment generation in the nation and besides the organizational management should strive to increase their sales and market share by embarking on product-oriented innovativeness. The organization managers should employ staff with innovative ideas to sustain their growth. However, in Ethiopia terms of innovation improvements as existing product or manufacturing of copied product with minor adjustments of new design copied from abroad or minor modification to production process or technological innovation. Thus, SMEs in Ethiopia their most activities are technological changes based on imitation with minor improvements. Regardless of the above, SMEs engaged in technological innovation are active in trying to adjust to changing demand condition by investing in skills and technology to go in line with change market needs. Since innovation and entrepreneurship hold the key to enhancing the role of SMEs in improving the Ethiopian economy and enables SMEs to transform relatively fast to large enterprise.

So the relation between growth & innovation: First According to Mulu Gebreeyesus(2009), In an extended model of firm growth determinants that includes innovation indicators they found strong evidence that innovators grow faster than non-innovators. Firm growth is also affected by other factors such as the firm's initial size, age, access to finance, sector, and

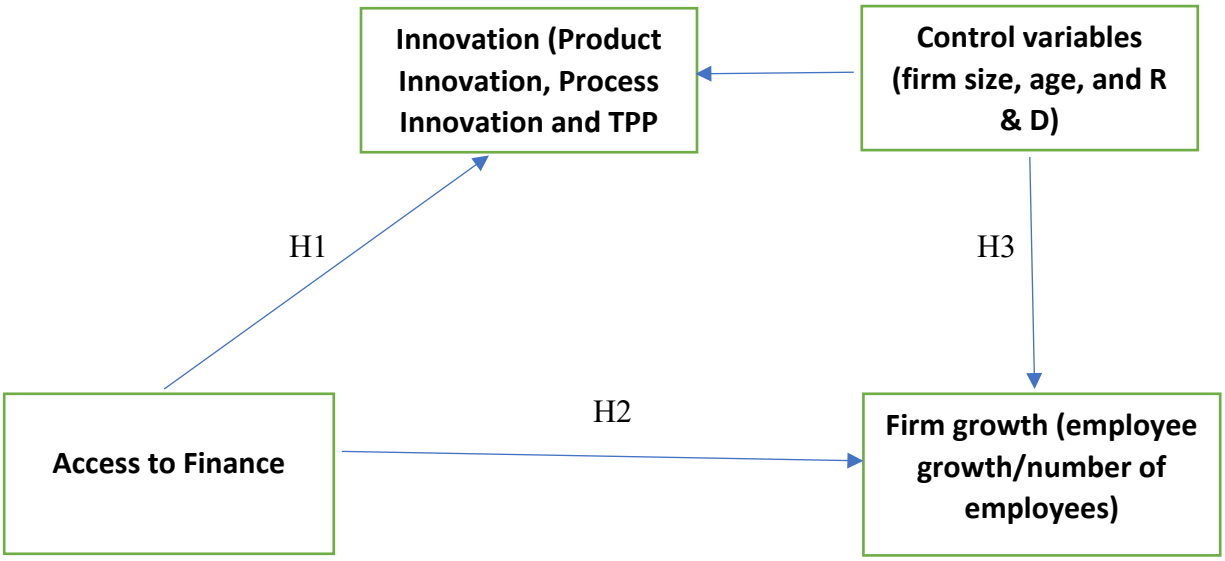
owner character. Our estimation results provide supporting evidence to the stylized fact that the smaller, younger, and less capital constrained firms grow faster than their counterparts. Firms in manufacturing also grow faster than other sectors. Second According to Iraj Hashia.et.al.,(2010),The findings reveal a positive relationship between innovation activities and productivity. Firms decide to engage in innovation and on how much to invest under pressure of competition. In making these decisions firms rely on the knowledge accumulated from previously abandoned innovations and cooperation with other firms and institutions and other members of their group. Subsidies lead to additional spending on innovation by firms but do not lead to additional innovation output. The results also show that larger firms are more likely to embark on innovation activities and invest more in innovation but innovation output decreases with firm size. Finally, results reveal several differences in behaviour of firms in two groups of countries. Third According to Alex Coada.et.al.,(2014) study the effect of R&D activities on firm growth (i.e., sales growth, productivity growth and employment growth). The results show that young firms face larger performance benefits from R&D at the upper quantiles of the growth rate distribution but face larger decline at the lower quantiles. R&D investment by young firms therefore appears to significantly riskier than R&D investment by more mature firms, which suggests some policy implications(SMEs). So based on the above discussion the following hypothesis was formulated

2.3. Conceptual Framework

A conceptual framework is a structure which the researcher believes can best explain the natural progression of the phenomenon to be studied (camp, 2001). It is linked with the concepts, empirical research and important theories used in promoting the knowledge advocated by the researcher (peshkin, 1993).

Figure 2.3 present the conceptual framework of the study. It shows the link between access to finance, TPP, and firm growth. Path H1 indicate hypothesis 1 which state the relationship between access to finance and firm growth, while path H2 and H3 show the link between access to finance and innovation and innovation and firm growth, respectively.

Figure 1. Conceptual framework



CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

This chapter presents about the study research methodology. The chapter organized in to five main contents. The first section presents the research design and approach. The second section presents data source and the data source method of data collection. The third section presents about sample selection, composition, and distribution. The fourth main section of the chapter presents about research models and econometric specification. Finally, definition and measurement of variables is presented.

3.1. Research Design

According to Kothari (2008), there are 3 types of research design: Descriptive, Exploratory and Explanatory research design.

***Descriptive research design*/statistical research/:** research that describes phenomena as they exist. It can be used to identify and classify the element or characteristics of the subject. It would include techniques like case studies, observation and review of previous related studies and data and also it involves with collecting data in order to test hypotheses or answer questions concerning the current status of the subjects of the study.

***Exploratory research design*:** type of research conducted for a problem that has not been clearly defined. It helps determine the best research design, data collection method and selection of subjects. It should draw definitive conclusions only with extreme caution. Given it is flexible and fundamental nature. Exploratory research often concludes that a perceived problem does not actually exist, and the results are not usually useful for decision-making by themselves, but they can provide significant insight into a given situation.

***Explanatory research design*:** the first type of correlational design and conducted when researchers want to explore the extents to which two or more variables co-vary, that is, where changes in one variable are reflected in changes in the other (Creswell, 2008). The purpose

of the study is to explore a new universe, one that has not been studied earlier and research is mainly concerned with causes (why) or factor about some phenomenon.

Therefore, the study focuses only explanatory research design to explore the effect of access to finance on innovation and growth in Ethiopia, because the issue is already known, need more investigation, not studied by different authors and the basic idea for economic development of this country.

3.2. Research Approach

According to Cresswell (2004) there are three types of research approach: qualitative, quantitative and mixed research. Qualitative Research Approach: the type by which are depending on human observations and descriptions. It is descriptive, no facts, highly subjective and designed to look beyond the percentages to gain an understanding of feelings, impressions and viewpoints.. This kind of method is used to assess knowledge's, attitudes, behaviours, opinions of people depending on the topic of research and experiences which are not allowed to be used in quantitative method at all. Qualitative research implies an emphasis on the qualities of entities and on processes and meanings that are not experimentally examined or measured (Denzin & Lincoln, 2005).

Quantitative research Approach: according to Vander Merwe (1996), is a research approach aimed at testing theories, determining facts, demonstrating relationships between variables, and predicting outcomes. Quantitative research uses methods from the natural sciences that are designed to ensure objectivity, generalizability, reliability, and reality that exists independent of human perception, the investigator and investigated are independent entities. Therefore, the investigator is capable of studying a phenomenon without influencing it or being influenced by it and concerned with the collection & analysis of data in numeric form (Guba and Lincoln, 1994).

Thus, quantitative approach is used to address the objective of this study. The study will design to describe a clear presentation of the variables under investigation and the basic features of the data in a study. They provide simple summaries about the sample and describe what is or what the data shows that will present in quantitative in a manageable form.

3.3. Data Sources and Type

The Study was investigated using secondary data because they are conducted to collect data from the World Bank Enterprise Survey (WBES). Since the Study was used secondary data based on Cross – sectional data type because they are involving different organisations or groups of people to look at similarities or differences between them at any one particular time and this study is done when time or resources for more extended research. It involves a close analysis of a situation at one particular point in time or pulled data.Therefor Cross sectional data type and secondary data source was used and data's are from world banks enterprise survey conducted in 2015 from (2012-2014) years inclusively for selected firms.The World Bank's Enterprise Surveys (ES) collect data from key manufacturing and service sectors in every region of the world. The Surveys use standardized survey instruments and a uniform sampling methodology to minimize measurement error and to yield data that are comparable across the world's economies. Thus, the use of properly designed survey instruments and a uniform sampling methodology provide a solid foundation for recommendations that stem from this analysis. The World Bank's Enterprise Survey aims to achieve the following objectives:

- provide statistically significant investment climate indicators that are comparable across countries;
- assess the constraints to private sector growth and job creation;
- build a panel of establishment-level data that will make it possible to track changes in the business environment over time, thus allowing impact assessments of reforms; and stimulate dialogue on reform opportunities.

3.4. Sample Selection, Composition and Distribution

According to WBES, 2015 the sampling methodology of the World Bank's Enterprise Survey generates sample sizes appropriate to achieve two main objectives: first, to benchmark the investment climate of individual economies across the world and, second, to conduct firm performance analyses focusing mainly on how investment climate constraints affect productivity and job creation in selected sectors. To achieve both objectives the sampling methodology:

- generates a sample representative of the whole non-agricultural private economy that substantiates assertions about this part of the economy, not only about the manufacturing sector. The overall sample should include, in addition to selected manufacturing industries, services industries and other relevant sectors of the economy; and
- generates large enough sample sizes for selected industries to conduct statistically robust analyses with levels of precision at a minimum 7.5% precision for 90% confidence intervals about: Estimates of population proportions (percentages), at the industry level and Estimates of the mean of log of sales at the industry level.
- Overall sample sizes for both Enterprise Surveys and Indicator Surveys are determined by the degree of stratification of the sample. The overall sample size depends on the decision of the sample size for each level of stratification and the objectives of stratification are to allow an acceptable level of precision for estimates, at, first, different size (small, medium, and large), second, at the different levels of regional stratification, and third, for the different sectors of stratification (which, as explained before, are chosen depending on the size of the economy).

Since the type of method chosen by the researcher depends on the objective of the research then quantitative method will use collected in advance. From qualitative and quantitative methods, the quantitative method is preferable because of it is objective, formally structured and a systematic process in which information is obtained using numeric data about a particular research topic. It is the collection of numeric data and explanation of the correlation between theory and research with an objective conception of social reality. The main characteristic of this method is the use of statistics to analyze data, result oriented approach to analyzing data which ignores the perspectives of the researcher thereby reducing the influence of subjectivity and it is very popular with a testing hypothesis which is more scientific on measurement.

In the 2015 world bank Enterprise Surveys for Ethiopia about of 849 firms were included. However, due to some screening criterion about 567 firms are actually included in our final sample. The screening criterion was 1) Micro firms (firms with less than 5 employees) are excluded, 2) Variables with Omitted data or spontaneous response of “I don’t know” are

excluded, and 3) observation with possible out layer effect are also dropped in order to have final sample of 567 firms.

3.4.1. Distribution of sample firms according to location

Out of 567 sampled firms 332 are located from Addis Ababa which is 58.6%, 17 firms are from Amhara which is 3.0%, 18 firms are from Dire Dawa which is 3.2%, 79 firms are from Oromia which is 13.9 %, 42 firms are from SNNPR which is 7.4 % and 79 firms are from Tigray which is 13.9 %. The sample selected from Addis Ababa is more than the rest of them.

Table.3.4. *Sample Composition according to Firm location*

No	Location	Frequency	Percentage
1	Addis Ababa	332	58.6
2	Amhara	17	3.0
3	Dire Dawa	18	3.2
4	Oromia	79	13.9
5	SNNPR	42	7.4
6	Tigray	79	13.9
Total		567	100

Table.3.2. Present sample distribution across firm size, firm age and sector. From total sample of 567 firms, small firms involved in the study are 242(42.7%), medium firms involved in the study are 185 (32.6%) while the remaining are large firms that are 140(24.7%) of sampled enterprises and it shows that the sample selection of the small firms is more than that of the medium and large firms.

According to Ayalew and Zhang (2019a), Young firms are the age between of 1 year up to 5 years that are 51 firms from the total sample that is 9.0%, and matured firms are from 6 years to 15 years the sample shows 302 firms which are 53.3% whereas old firm is above 15 years that are 214 firms, and the percentage indicates 37.7%. Thus, matured firm are dominated sample selection than that of young and old firms.

On the other hand, sample composition of sector shows from the total number of firms 270 are manufacturing which is 47.6%, while 109 are service & retail firm which is 19.2% and the remaining 188 firms which is 33.2% are non-retail services. So, the sample selection shows that the number of manufacturing firm is greater than service & retail firm and retail services.

Table.3.2. *Sample Composition according to firm size, firm age & sector according to firm size*

Sub group	Size	Frequency	Percentage
Sector	Manufacturing	270	47.6
	Retail Services	109	19.2
	Non-Retail Services	188	33.2
Firm Age	Young (1 to5 years)	51	9.0
	Matured (6 to15 years)	302	53.3
	Old (above 15 years)	214	37.7
Firm Size	Small (5 to 19 permanent employees)	242	42.7
	Medium (20 to 99 permanent employees)	185	32.6
	Large (100 or more permanent employees)	140	24.7

Table 3.3 present the distribution of sample according to the industry type. Based on the WBES industry classification, we classify firms in to 15 industry types. Firm were classified according to type of industry, from the total sample of 567 SMEs included on the study 10 firms were from basic metal industry which is 1.76%, 11 firms were from Chemicals industry which is 1.94%, 62 firms were from construction & Plastic industry which is 10.93%, 3 firms ware from Electronics & Information technology which is 0.53%, 15 firms were on fabrication Metal industry which is 2.64%, 65 firms were from Food industry which is 11.46%, 24 firms were from furniture & Wood industry which is 4.23%, 53 firms were from Garment Textile & Leather industry which is 9.35%, 76 firms were from hotel & other service which is 13.4%, 3 firms were from machineries which is 0.53%, 45 firms were from non-metal & procession which is 7.94%, 21 firms were from Paper & Publishing which is

3.72%, 52 firms were from Retail which is 9.17%, 48 firms were from transportation which is 8.47% and 79 firms were from Wholesaler which is 13.93%. So, the data collection according to industry shows more data is collected wholesalers, food, hotel and restaurants and retails than other industries and the result may have more effect on these services.

Table.3.3. *Sample composition according to industry*

No	Industry	Frequecy	Percentage
1	Basic metal	10	1.76
2	Chemicals	11	1.94
3	Construction & Plastic	62	10.93
4	Electronics & IT	3	0.53
5	Fabrication Metal	15	2.64
6	Food	65	11.46
7	Furniture and wood	24	4.23
8	Garment, Textile & Leather	53	9.35
9	Hotel and Other services	76	13.4
10	Machineries	3	0.53
11	Non-metal & Procision	45	7.94
12	Paper & Publishing	21	3.72
13	Retail	52	9.17
14	Transport	48	8.47
15	Wholesaler	79	13.93
	Total	567	100

3.5. Research Models and Econometric Specifications

The dependent variable 'innovation' is measured based on a binary response that takes value 0 and 1. Thus, the choice is whether to use logit or probit model. For the majority of the applications, the logit and probit models were given very similar characterizations of the data because the densities are very similar. Both approaches are much preferred to the linear probability model (Brooks, 2008). Therefore, this study was used a cross sectional probit model which drive from the latent regression of the form

$$y^* = x\beta + \varepsilon, \qquad y = 1[y^* > 0] \tag{3.1}$$

Where y^* is unobserved variable ranging from -∞ to ∞, ε is a continuously distributed variable independent of x, and the distribution of ε is symmetric about zero. x is a vector of explanatory variables, and its primary goal is to explain the effect of x_i on the response probability $p(y = 1 \mid x)$ the and β *is* a vector of parameters, respectively. The probit model uses the cumulative normal distribution function (Φ) to transform the model (Brooks, 2008). Model to investigate the effect of access to finance on innovation (probit model)

$$INNOV = \beta_0 + \beta_1 AccFin + \beta_2 ConVar + \varepsilon \tag{3.2}$$

Where INNOV, refer innovation, AccFin, represent access to finance, ConVar represent control variables such as firm size, firm age and R&D.

However, in order to examine the effect of access to finance (AccFin) and innovation (Innov) on firms Growth using Ordinary Least Square (OLS) regression. This is due to the fact that the dependent variable (growth) is measured in continuous form. By including control variables (size, age, R&D) the model to examine the effect of access to finance and innovation on SMEs growth (OLS) can be specified as follows.

$$GROWTH = \beta_0 + \beta_1 INNOV + \beta_2 AccFin + \beta_3 ConVar + \varepsilon \tag{3.2}$$

$\boldsymbol{Where}$ $\boldsymbol{\beta_0}$ – Constant

$\boldsymbol{\beta 1}$ –Coefficient of technological innovation

$\boldsymbol{\beta 2}$ - Coefficient of access to over drift

$\boldsymbol{\beta 3}$ - Coefficient of control variable

ε -Error

3.6. Variable Definition and Measurement

3.6.1. Measurement of Technological innovation

Innovation is defined as the implementation of a new or significantly improved product (good or service) or process, a new marketing method or a new organizational method in business practices and used as a dependent and independent variable for different purposes. Innovation is independent variable for growth of firms and dependent variable for access to finance. Innovation is measured by input indicator (R&D expenditures or the percentage of the R&D employees) and output indicators (product and process innovations).

Technological innovativeness refers to the process of firm master and tools to design and produce products/services that are new to the business irrespective of whether the products/services are new to their competitors or their customers or the world (Rahman, Yaacobb, & Radzi, 2016). This implies that it involves the required practical tools, equipment, and techniques that make changes in the production and processes that result in novelty that adds values to customers and the market. It is the instrument tools, equipment, materials, methods, and process to engage in and support new ideas, novelty, experimentation, and creative process resulting in newness.

3.6.2. Measurement of Access to finance

Access to finance used as independent variable for innovation and growth of firm. Since WBES address the sources of finance for enterprises are internal/retained earnings; owners' contribution or new equity finance; External/bank finance; financed from non-bank financial institutions which include microfinance institutions, credit cooperatives, credit unions or finance companies; trade credit which represent credit due to purchases on credit from

suppliers and advances from customers; other sources which include money lenders, friends, relatives and bonds. Finance is measured by Working capital and Purchasing power of fixed assets.

Access to finance overdraft facility (Access_Fin_OD) or line of credit/loan (Access_Fin_CL): The fundamental element for the development of SMEs is the respective capacity to access finance. The financial debt instruments commonly used by SME are trade credit, bank loans, credit lines, and overdrafts. Proportionally as large as become an enterprise, as likely is to increase its credit needs. More than half of SMEs in Europe forecasted significant business growth using bank loans, trade credit or supplier's credit, and investments made by shareholders. The availability of financing is one of the most important obstacles to start businesses. The drivers considered important by the SMEs to improve access to loans and funding are the governmental measures such as tax exemptions, whereas the less important drivers were export guarantees and equity investments. Regardless of the existing different types of credit offers in the market, most SMEs have no information or knowledge to take advantage of the available credit instruments. Based on the research findings and related empirical analysis, an increase in credit accessibility-supported for SMEs may significantly promote the growth, wealth, and employment rates in the country (David F. Moreiraa, 2016)

Access to credit or loans for innovative firms is a positive association with innovation. However, they find that innovative firms faceless binding credit limits and less likely to overdraw funds than the others. These findings together suggest that, on one hand, banks evaluate innovative firms to be riskier, and then charge them a higher price. At the same time, on the other hand, banks also seem to recognize that innovative firms are more profitable than other firms and reward them with less Protecting credit limits. This study shows that innovation is a key determinant for the probability that a firm will experience binding credit limits for those firms that are more likely to suffer from problems related to information asymmetry. Among them, banks evaluate positively, in term of credit availability, the presence of an innovative activity carried out by the firm. These findings seem to suggest that innovation may reduce the presence of credit constraints among those firms that, typically, may suffer more from financing constraints. For these firms, innovation

may help to avoid the costly option of overdrawing expensive funds (Favaretto and Zanfei, 2007).

Access to Finance (FIN_CON) Or Obstacle access to finance (FIN_OBS) (alternative measure of financial constraints): The study focused on two innovation factors: first, those affecting product and process innovation second, and those affecting a firm's financial constraints. The results are similar for both product and process innovations. Control variables are directly associated with product innovation, but financial constrain are inversely associated with product innovation and Process innovation. Their more resource for larger firms more financial resources and enable them to commit to innovating more than smaller firms. To evaluate the factors that affect financial constraints on innovation and found that the environment, number of banks, and percent of debt held by a firm's bank were directly associated with financial constraints. Since the higher debt levels create more risk and impose greater demand for resources. Then firms limit their commitment to innovation. So the result suggests that small firms are not willing to ensure risks and commute less to innovate. Thus, they increase competitive advantage in the market. When firms face stronger financial challenges then they maintain their commitment to innovation to ensure their long-term viability (Madrid-Guijarro A, el.ta (2016)).

3.6.3. Measurement of Performance

Growth is dependent variable for technological innovation and access to finance. This study used employee growth as indicators of growth which is measured by the number of employees. Chinazor Franca Obunike & Ama Aka Udu (2018), Growth can be attributed to an increase in factors of production, improvements in the efficient allocation across economic activities, knowledge and rate of innovation. Innovativeness is considered as one of the critical issues in the firm growth. The dimension of business growth used in this study intended to includes employment growth, sale growth, firm size growth and market share growth.For Instance because the limitation of the data study focus only on Employment growth.

Employee Growth: employment generation is a very important aspect of the country's economic growth. Small businesses are seen as a great force in generating employment in the country. Employees are the most crucial resource of an organization. Some expertise fixes in them. The quality of employees affects the firm ability to embark on innovativeness. Product innovation improves employment, while process innovation is associated with job losses.

3.6.4. Control Variables

Control variables refer to those variables which affect both innovation and growth but are not the main interest of this study. However, the model should control these variables to arrive at a concrete empirical finding. Literarily, there is no need for the developed hypothesis that indicates the relationship between control variables and dependent variables. The model controls the effect of firm size, firm age, and Research and Development (R&D) on SME's TPP and growth.

Firm size: have effect on the access to finance, level of innovation or growth of firm due to different reason either as a result of capital market imperfections or due to the level of productivity. The situations that size can adversely affect innovation. For instanc, for the type of innovation that required huge capital investment, large firms may have an advantage over smaller firms because large firms have better access to finance. But empirical studies do not reach unanimous conclusions regarding the relationship between size and innovation. The majority of these support the positive relationship and some of them find a negative relationship, whereas Ayalew.et.al.,(2019a) shows that size has a positive significant effect on innovation on the magnitude of the marginal effect increase, along with an increase in firm size. Therefor large firms are more innovative than small firms.

Firm age (Young,Matured & older): have effect on firms with related to access to finance, level of innovation or growth of firm due to time/ depreciation or firm ownership status.For the situation firm age can adversely affect innovation. New entrants are vital sources of novel and technologically superior products and processes, rendering younger firms more likely to innovate. Researchers view assumes that new firms tend to present the highest probability of innovation, while the oldest firms tend to show a lower. The empirical studies in the age

effect on innovation is also not cleared. However, the majority tends to age has a positive effect on the process of innovation and adverse effect for firms in the level of industry.But others show mixed evidence that firm age has a significant negative impact on young firms while it has an insignificant impact on old firms. Experience helps the older firms to produce incremental innovation, whereas the newer firm brings important discovery of innovation. Finally, officers tended to conduct R&D and applied incremental innovation, while the younger firms entered with new technologies and applied exploratory R&D like radical innovation. Whereas Ayalew.et.al, (2019a) shows firm age has no statistically significant relationship with the probability to innovate. Therefore, firm age may or may not have significant effect to be innovating.

Research and developments (R&D): Productivity and employment have effect on level of innovation and growth of firm because they are recognized as an input factor to industrial production and technological improvements for innovations and they may have effects on competitiveness, innovation and long-run economic performance.Expenditure on R&D has been recognized as an essential input factor to industrial production, technological improvements, and a manifestation of a systematic search for inventions and innovations.Since R&D is not sufficient condition but it may have detrimental effects on competitiveness, innovation, and long-run economic performance.However, R&D expenditure is not equally important to all sizes of firms, it is more valuable to large firms.

The majority of empirical studies confirms the presence of a strong relationship between R&D expenditure and innovation. For instance, recent studies found a positive effect of R&D expenditure on firm's innovation performance. Whereas Ayalew.et.al, (2019a) shows the effect of R&D expenditure on the firms to innovate is found to be largely significant and positive. The marginal effect for this variable is relatively higher compared to all other variables.Therefor R&D has positively significant effect to innovate.

***Table 3.4**, Variable definition and sample selection criterion*

Variable	Measurement and definition	Measure adopted from	Question No WBES
Main dependent and independent variables			
Technological Product or Process (TPP)	Dummy variable equal to 1 if a firm introduced the improved product or improved process in the last 3 years, 0 otherwise.	Ayalew Xianzhi, Hailu, Dinberu (2019)	H1 &H2
Employee Growth	The difference between the current year permanent employees and the number of permanent employees three years before the survey year divided by the current year number of permanent employees.	Ayalew and Xianzhi (2019b), Gorodnichenko and Schnitzer (2013),	L1 & L2
Access to finance overdraft facility (Access_Fin_OD)	Dummy variable equal to 1 if a firm has access to overdraft facility during the time of survey, 0 otherwise.	Gorodnichenko and Schnitzer (2013)	K7
Access to finance line of credit/loan (Access_Fin_CL)	Dummy variable equal to 1 if a establishment have a line of credit or a loan from a financial institution, 0 otherwise.	Fowowe (2017) , Lee el.ta (2017),	K8
Access to Finance (*FIN_CON*)	A dummy variable take value 1 if the firm; 1) have no external sources of finance, 2) applied for loan/credit but their application was rejected, withdrawn, or still in process, 3) need external fund but did not apply for loan/credit because they are discouraged, and 4) Applied for loan/credit but their application approved in part and has no overdraft facility, zero otherwise.	Popov and Udell (2012), Kuntchev, Ramalho, Rodríguez-Meza, and Yang (2013) and Ayalew and Xianzhi (2019),	K8, k16, k17,k20, k7
Obstacle access to finance (*FIN_OBS*)	A dummy variable take value 1 if the firm report major or sever obstacle access to finance for their current operations, 0 otherwise.	Ayalew and Xianzhi (2019), and Mateut (2018)	K30
Control variables			
Firm size (*Log(size))*	Natural logged value of the number of permanent full-time employees.	Gorodnichenko and Schnitzer (2013),	L1
Firm Age (*Log(age))*	Natural logged value of age in years of a firm since its establishment.	Ayalew and Xianzhi (2019)	B5
Research and development s (*R&D*)	Dummy variable equals to 1 if a firm conducts internal or external R&D, 0 otherwise.	Savignac (2008)	H8

WBES of 2015 (2012-2014) firms are asked question First (H.1), *has this establishment introduced new or improved product or services?* Response to this question indicates whether the firm introduced product innovation or not. Second (H.2), *Were any of the new or improved products or services also new for the establishment's main market?* Response to this question indicates whether the firm introduced product innovation for market or not. Based on their response to the question (H.1&H.2), dummy variable equal to 1 if a firm introduced the improved product or improved process in the last 3 years, 0 otherwise. This measure is related previous studies that also used variables as measures of new or improved product and process innovation outputs (Ayalew et.al (2019a)

Firms asked question first (L.1)**,** *how many permanent, full-time individuals worked in this establishment?* The response indicates to this question the number permanent employee at the end of fiscal year. Second (L.2)**,** *how many permanent, full-time individuals worked in this establishment?* The response to this question is the total number of permanent employees. Based on their response to the question (L,1 & L,2), The difference between the current year permanent employees and the number of permanent employees three years before the survey year divided by the current year number of permanent employees. This measure is related previous studies that also used variables as measures for performance of firm. (Ayalew and Xianzhi (2019b), Gorodnichenko and Schnitzer (2013)).

Firms asked question of access to finance, first access to overdraft (K.7), *does this establishment have an overdraft facility?* The response indicates whether the firm has access to overdraft facility or not. Based on the response to question (K.7), dummy variable equal to 1 if a firm has access to overdraft facility during the time of survey, 0 otherwise. This measure is related previous studies that also used variables as measures for access to finance (Gorodnichenko and Schnitzer (2013)).

Second question of access to line of credit or loan (K.8), *does this establishment have a line of credit or a loan from a financial institution?* The response indicates whether the firm has access to line of credit/loan or not. Based on the response to (k.8), dummy variable equal to 1 if a establishment have a line of credit or a loan from a financial institution, 0 otherwise.

This measure is related previous studies that also used variables as measures for access to finance (Fowowe (2017), Lee el.ta (2017)).

Third financial constraints (K.**7)** *does this establishment have an overdraft facility?* (K.8) *does this establishment have a line of credit or a loan from a financial institution?* (K.16) *did this establishment apply for any lines of credit or loans?* (K.17) *what was the main reason why this establishment did not apply for any line of credit or loan?* (K.20) *what was the outcome of that application?* The response indicates whether there is facility of access to overdraft or line of credit/loan or not, whereas the firm does not apply for line credit/loan or there is no response for the application. Based on the response to the above questions, dummy variable take value 1 if the firm; 1) have no external sources of finance, 2) applied for loan/credit but their application was rejected, withdrawn, or still in process, 3) need external fund but did not apply for loan/credit because they are discouraged, and 4) Applied for loan/credit but their application approved in part and has no overdraft facility, 0 otherwise. This measure is related previous studies that also used variables as measures for access to finance (Popov and Udell (2012), Kuntchev, Ramalho, Rodríguez-Meza, and Yang (2013) and Ayalew and Xianzhi (2019)).

Fourth question is (K.30), *to what degree is Access to Finance an obstacle to the current operations of this establishment?* The response shows whether there is financial obstacle or not. Based on the response, dummy variable take value 1 if the firm report major or sever obstacle access to finance for their current operations, 0 otherwise. This measure is related previous studies that also used variables as measures for access to finance (Ayalew and Xianzhi (2019))In general access to finance is measured based on one or more of the above measurements.

To indicate the effect of control variables firms asked first question of firm size (L.1)**,** *how many permanent, full-time individuals worked in this establishment?* The response indicates that number permanent employee in the firm. Based on the response, Natural logged value of the number of permanent full-time employees. This measure is related previous studies that also used variables as measures the effect of performance of the firm as well as level of innovativenessAyalew and Xianzhi (2019), Second question of firm age (B.5), *in what year*

did this establishment begin operations? The response indicates that the age of the firm. Based on the response, Natural logged value of age in years of a firm since its establishment. This measure is related previous studies that also used variables as measures the effect of performance of the firm or level of innovativeness (Gorodnichenko and Schnitzer (2013),

Ayalew and Xianzhi (2019)Third control variable of R&D, (H.8), *did this establishment spend on research and development activities, either in-house or contracted with other companies, excluding market research surveys?* The response indicates that firm conducts R&D in current year. Based on the response, dummy variable equals to 1 if a firm conducts internal or external R&D, 0 otherwise. This measure is related previous studies that also used variables as measures the effect of performance of the firm or level of innovativeness Ayalew and Xianzhi (2019)

CHAPTER FOUR

DATA PRESENTATION ANALYSIS AND INTERPRETATION

This section presents results and findings from the study and also present findings of the analysis based on the objectives of the study. The first section is descriptive statistical analysis, correlation and VIF result as well as normality test using skewness statistics, the second section regression result of TPP in probit regression model and firms growth result in OLS regression result, and the last section is about summary of the result and recommendations.

4.1. Descriptive Statistics

Description of variables used in the study and their descriptive statistics are presented in Table 4.1. On average, 41.95 of sampled have introduced technological product and process innovation during the three years prior to the survey while employee growth is approximately 11.6 percent with maximum loss of 133 percent and maximum profit 80 percent. Regarding access to finance indicators, on average, 21.6 percent of sample firms have access to overdraft facility, while approximately 42.1 percent of sampled SMEs have access to new line of credit or loan. Our other measures of access to finance the existence of "financing constraints" show that on average 70.3 percent of in Ethiopia encountered financial constraints during the study period which is very high compared to universal average of about 20 percent (see Ayalew and Xianzhi, 2019a). Obstacle access to finance shows that more than half of sampled firms reported access to finance was a major obstacle for their growth and operation.

The summary statistics for the controls variables (Firm size, firm age, and R&D) show that firms included in the sample have on average 22 permanent employees with a maximum of 98 and minimum of 5 employees. Approximately, firms included in the sample have an age of 13 years indicating majority of firms includes in the sample are matured firms with a minimum of 3 years and maximum of 60 years old. On average, only 5.6% of firms conduct

internal or external R&D during the sample period. The skewness statistic for most of the variables is near to zero except for sales growth. Which shows variables
Considered in the sample do not deviate to much from the normal distribution.

Table.4.1. *Summary of descriptive statistics*

Variable	Obs.	Mean	Std. Deviation	Minimum	Maximum	Skewness
TPP	567	0.48	0.500	0	1	0.090
Access to overdraft facility	567	0.31	0.462	0	1	0.817
Access to credit or loan	567	0.47	0.500	0	1	0.075
Financial Constraints	567	0.70	0.459	0	1	-0.845
Employee Growth	567	0.10	0.30	-1.40	0.81	-1.304
Sales Growth	567	0.11	0.79	-12.70	0.95	-9.360
Log size	567	1.47	0.63	0.70	3.75	0.697
firm Age	567	16.03	13.41	3	90	2.395
Financial obstacles	567	2.49	1.43	1	5	0.475
R&D	567	0.10	0.29	0	1	2.738

4.2. Correlation Matrix and VIF Analysis

Table 4.2 shows the Pearson correlation among the predictor variables is very small with a maximum value of 0.425 which is between the variables access to line of credit or loan from financial institutions and access to over drift facility. This indicates there is no multicollinearity problem among the explanatory variables.

Table.4.2. *Correlation matrix*

Code		1	2	3	4	5	6	7	8	9
1	Access to overdraft facility	1								
2	Access to line of credit or loan	0.425	1							
3	Constraints	0.021	0.216	1						
4	Employee Growth	0.018	0.035	-0.011	1					
5	Sales Growth	-0.024	0.017	-0.091	0.265	1				
6	Logsize	0.375	0.251	-0.098	-0.021	0.001	1			
7	firm Age	0.167	0.125	-0.016	-0.167	-0.041	0.385	1		
8	R&D	0.149	0.149	0.069	0.047	0.004	0.27	0.069	1	
9	Financial obstacles	-0.094	0.068	0.327	0.027	-0.036	-0.094	-0.105	0.116	1

Table 4.2 presents the variance inflation factor (VIF) and the tolerance (1/VIF) results. The VIF value is much less than the minimum standard of 10 when multicollinearity exist. The tolerance is also found by subtracting the coefficient of determination from one ($1 – R^2$). A maximum standard value for tolerance is 0.10 when multicollinearity exists among the variables. All predictors have tolerance level much greater than 0.1. Therefore, there is no multicollinearity problem in our model.

Table.4.3. *VIF and Tolerance to assess multicollinearity*

	Tolerance (1/VIF)	VIF
TPP	0.8697	1.1499
Access to overdraft facility	0.7744	1.2912
Access to line of credit or a loan	0.7515	1.3306
Constraints	0.8447	1.1839
Employee Growth	0.9489	1.0539
Log size	0.9311	1.0741
Firm Age	0.892	1.1211
R&D	0.9103	1.0986
Financial obstacles	0.859	1.1641

4.3. Heteroscedasticity tests

To test heteroscedasticity, whether the variance of the errors in the regression model is constant or not, we use the White Test. The Heteroskedasticity test conducted using White test and reported below in table 4.3. According to this test, if the p value is greater than 0.05, the null hypothesis of the variance of the residuals is homogenous must not be rejected. The Heteroskedasticity test show that the F-statistic is 0.07 and its p-value is 0.7867 confirming there is no Heteroskedasticity problem in our model.

Table.4.4. *White test of Heteroscedasticity*

White test
Ho: Constant Variance
Variable: Fitted values of employement growth
F(1, 557) = 0.07
Prob > F = 0.7867

4.4. Regression results

In this section we discuss the results of the probit and ordinary least square (OLS) regression model results. In the first part we discuss the effect of access to finance and other covariates on the implementation of the firm improved product or improved process (TPP). In the second part we discuss the effect of access to finance and other covariates on the employment growth of the firm.

From table 4.3 we can see information on the fit of the regression model. The likelihood ratio chi-squared value is significant at 9 degrees of freedom with p-value 0.0000. This shows the full model containing the predictors is significant improvement over the null model.

The results are reported in the following section.

The effect of access to finance on TPP measured by overdraft facility is presented in Table 4.5. The overdraft variable and the control variables logsize and R & D are strong significant variables that affect the firms TPP whereas the logage is not significant. Firms that invest on overdraft facility are more likely to innovate than those who do not invest on the facility (P-value 0.000) at 5% level of significance. The log of the size of the firm has positive significant effect on TPP with p-value 0.000 at 5% level of significance. Firms who invest on Research and development have strong positive effect on TPP with p-value 0.000 at 5% level of significance.

Table.4.5. The effect of Overdraft facility on TPP

TPP	Coef.	Std. Err.	z	P>|z|	95% Confidence interbval	
Access_Fin_OD	0.4901907	0.1264139	3.88	0.000***	0.242424	0.7379574
Logsize	0.3951136	0.1041451	3.79	0.000***	0.1909929	0.5992343
Logage	0.0868486	0.2096819	0.41	0.679	-0.3241204	0.4978175
RandD	0.8277267	0.2223751	3.72	0.000***	0.3918795	1.263574
_cons	-0.9556432	0.2264745	-4.22	0.000***	-1.399525	-0.5117614

No. Obs. = 567

Log Likelihood = -348.74018

LR Chi^2 (8) = 87.77

Prob > Chi^2= 0.1118

Pseudo R squared = 0.11404

Note: 1) the dependent variable "TPP" is a dummy variable equal to 1 if a firm introduced the improved product or improved process in the last 3 years, 0 otherwise. 2) *** denotes significant at 1% level 3) the full Stata output is reported in Appendix A

The effect of access to finance (line of credit or loan) on TPP is presented in Table 4.6. Access to finance variable and the control variables logsize and R & D are strong significant variables that affect the firms TPP whereas the logage is not significant. Firms that have access to finance (line of credit or loan) are more likely to innovate than those who do not have the access (P-value 0.000) at 5% level of significance. The log of the size of the firm has positive significant effect on TPP with

p-value 0.000 at 5% level of significance. Firms who invest on Research and development have strong positive effect on TPP with p-value 0.000 at 5% level of significance.

Table.4.6. The effect of access to line of credit or loan on TPP

TPP	Coef.	Std. Err.	z	P>|z|	95% Confidence interbval	
Access_Fin_CL	0.4728	0.1127	4.2	0.000***	0.2519	0.6937
Logsize	0.4686	0.1004	4.67	0.000***	0.2718	0.6654
Logage	0.0896	0.2096	0.43	0.669	-0.3211	0.5004
R&D	0.8021	0.2226	3.6	0.000***	0.3657	1.2384
_cons	-1.1342	0.2277	-4.98	0.000***	-1.5806	-0.6879

No. Obs. = 567

Log Likelihood = -347.46914

LR Chi^2 (4) = 90.31

Prob > Chi^2= 0.000

Pseudo R squared = 0.1150

Note: 1) the dependent variable "TPP" is a dummy variable equal to 1 if a firm introduced the improved product or improved process in the last 3 years, 0 otherwise. 2) *** denotes significant at 1% 3) the full Stata output is reported in Appendix A

The effect of access to finance on TPP including other control variables is presented in Table 4.5. Access to finance significantly positively affect the firms TPP with p-value 0.017 at 5% level of significance. Access to finance measured by overdraft facility also significantly affect the firms TPP with p-value 0.003 at 5% level of significance. The log of the size of the firm has positive significant effect on TPP with p-value 0.000 at 5% level of significance. Firms who invest on Research and development have strong positive effect on TPP with p-value 0.001 at 5% level of significance. Employment growth has also significant positive effect on TPP with p-value 0.005 at 5% level of significance. The firm's financial growth and log(age) doesn't seem have an effect on the firm's TPP.

Table.4.7. The effect of access to finance on TPP

TPP	Coef.	Std. Err.	z	P>|z|	95% Confidence interbval	
Access_Fin_OD	0.3288	0.1377	2.39	0.017**	0.0588	0.5987
Access_Fin_CL	0.3611	0.1229	2.94	0.003***	0.1201	0.6021
Emp_Growth	0.5661	0.2035	2.78	0.005***	0.1671	0.9651
Sales_Growth	-0.0417	0.0762	-0.55	0.583	-0.1911	0.1075
Logsize	0.3987	0.1068	3.73	0.000***	0.1893	0.6081
Logage	0.2700	0.2217	1.22	0.223	-0.1645	0.7047
RandD	0.7598	0.2264	3.36	0.001***	0.3160	1.2035
Fin_Obs	0.0238	0.0402	0.59	0.554	-0.0551	0.1028
_cons	-1.4102	0.2779	-5.07	0.000***	-1.9550	-0.8655

No. Obs. = 559

Log Likelihood = -332.58

LR Chi^2 (8) = 108.64

Prob > Chi^2= 0.0000

Pseudo R squared = 0.11404

Note: 1) the dependent variable "TPP" is a dummy variable equal to 1 if a firm introduced the improved product or improved process in the last 3 years, 0 otherwise. 2) ***, **, and * denotes significant at 1%, 5%, and 10% significant level, respectively. 3) the full Stata output is reported in Appendix A.

The second primary objective of this thesis is to assess the effect of access to finance and innovation on the firm's growth. To assess this effect the OLS regression model specified in chapter three is used. STATA software is used to fit the model. The normality and homoscedasticity assumptions are tested. As it can be seen from the summary table, the skewness statistics for most of the explanatory variables is near to zero which shows the normality assumption is fulfilled for these variables. But the variables sales growth, firm age and R & D deviate from normality to some extent but this does not significantly affect the analysis since most of the explanatory variables fulfils the normality assumption (Addisalem, T., 2020). Regarding the test of heteroscedasticity, the White test is used and confirmed that there is no Heteroskedasticity problem in our model.

The fit of the model is also assessed by using ANOVA and the coefficient of determination (R squared) value. The F-value from the ANOVA table (See Appendix A) is 10.77 with p-value 0.0000 at 5% level of significance. This shows the model fits well to the data. The coefficient of determination (R squared) is 0.1355. This shows 13.55 percent of the variation on the employment growth is caused by the variation of the explanatory variables the rest 86.55 percent of the variation is explained by unknown factors.

Table 4.8 presents the effect of access to finance and Innovation on SME's growth. TPP, sales growth and logage are significant variables. The Innovation variable TPP which denotes the firm's usage of improved product or process in the last three years significantly positively affect the employment growth of the company with p-value 0.006 at 5% level of significance. A unit change in improved product or process in the company change the growth of the employment by 0.0731903. Sales growth also significantly positively affect the employment growth with p-value 0.000 at 5% level of significance. A Unit growth in sales on average increases the employment by 0.0961343. Logage significantly negatively affect the employment growth. A unit increase in the logage decreases employment by 0.2386928. In our study access to line of credit and access to finance measured by overdraft facility has no impact on the employment growth of the firm.

Table.4.8. The effect of access to finance and TPP on employment growth

Emp_Growth	Coef.	Std. Err.	t	P>|t|	95% Confidence interbval	
Access_Fin_OD	0.0419	0.0300	1.4	0.164	-0.0171	0.1010
Access_Fin_CL	0.0223	0.0269	0.83	0.407	-0.0305	0.0752
TPP	0.0731	0.0263	2.78	0.006***	0.02149	0.1248
Sales_Growth	0.0960	0.0151	6.32	0.000***	0.0662	0.1259
Logsize	-0.0035	0.0230	-0.16	0.877	-0.0489	0.0417
Logage	-0.2386	0.0455	-5.24	0.000***	-0.3281	-0.1492
R & D	0.0229	0.0434	0.53	0.598	-0.0623	0.1082
Fin_Obs	0.0002	0.0086	0.03	0.974	-0.0167	0.0172
_cons	0.2937	0.0564	5.21	0.000	0.1829	0.4045

No. Obs. = 559

F (7, 551) = 10.77

Prob > F = 0.0000

R squared = 0.1355

Adj. R squared = 0.1229

Note: 1) the dependent variable “Emp_Growth” which the employee growth of the firm is a continuous variable, 2) ***, **, and * denotes significant at 1%, 5%, and 10% significant level, respectively. 3) the full Stata output is reported in Appendix A.

CHAPTER FIVE

Conclusion and recommendation

5.1 Conclusion

The paper primarily aims to address the following two objectives, one is to assess the effect of access to finance on firm's innovation. The second objective is to examine the effect of access to finance and innovation on the growth of the firm. It used a sample of 567 sample firms in Ethiopia. The data was obtained from the WBES which is conducted in 2015 covering the period 2012 to 2014. In the study used a standard probit model and OLS regression to examine the impact of access to finance on TPP (innovations) and the effect of access to finance and TPP on firm's growth in Ethiopia, respectively. Thus, a quantitative research approach along with explanatory research design was used.

The result obtained from the probit regression estimate show that firms that have access to finance are more likely to innovate than those who do not have. The study used different indicators of access to finance. Moreover, the of multiple linear regression (OLS estimate) model estimate show that access to finance and TPP have a statistically significant positive effect of firm's growth as measured by employee's growth.

In the study, we control firm size, firm age and R&D as a control variable. The result on these control variables shows that a firm size (Log(age)) is significantly negatively affect the employment growth. Firms who invest on Research and development have strong positive effect on TPP. The firm's financial growth and log(age) doesn't seem have an effect on the firm's TPP. Finally, on average, 48% of sampled firms has introduced new or significantly improved product or process during the last three years prior to the survey. Approximately less than 40% of sampled firms has only access to external finance.

5.2 Recommendation

This study revealed that access to finance and overdraft facility has great impact on the product and innovation of firms. financial institutions and the government have to prioritize in facilitating credit and loan to business firms. It is essential to design a rounded framework to have a deeper financial system, thereby enhancing availability and lowering the cost of credit. Banking regulations and government policies need to support credit availability to businesses firms to achieve their goal.

Firms also should enhance the research and development unit in line with their business affairs. R&D may help companies to achieve future growth and maintain their relevance in their chosen market. Spending resources on investigation and testing to develop new products or new ways of doing things is found to be very important. A firm should also support the enhancement of existing products or processes.

On the other hand, the growth of companies is unattainable unless they improve their products and process. The introduction of goods or services that is new or significantly improved characteristics has to be realized and also a new or significantly improved production or delivery methods has to be implemented in order to achieve the growth of the firm.

5.3. Limitations and Future Research Directions

Although this study is the first in its kind conducted in Ethiopia, it is not free of limitations that open avenue for future researchers. Among others, this study has the following limitations. First, this study mainly used Technological Product or Process innovation (TPP) as a measure of SMEs innovation performance. It did not consider other innovation performance measures such as patent, marketing and organizational innovations. Second, the study used employee growth as a measure of firm's growth. This is due to the fact that most small business may have proper record of revenue and expenditure. Literarily, accounting growth measures such as sales growth might have good implication than using employee growth. Third, this study used cross-sectional survey data that comes from the WBES. This indict of panel data might provide robust finding.

Finally, recent studies conducted such as by Ayalew and Xianzhi (2019b) stress most access to finance measures are endogenous to the innovation models. Unfortunately, this study did not address the possible endogeneity problem in the model. Thus, future researchers can fill and strengthen the findings of this study by filling the above gaps. Finally, whether politically connected firms obtain better access to finance and exhibits better growth performance is not empirically examined from the Ethiopian perspective, thus we recommend future researchers to conduct research on this area.

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Appendix A

1. The effect of access to over drift facility on TPP

```
Iteration 0:   log likelihood = -386.91005
Iteration 1:   log likelihood = -332.74462
Iteration 2:   log likelihood = -332.58839
Iteration 3:   log likelihood = -332.58829
Iteration 4:   log likelihood = -332.58829

Probit regression                                 Number of obs     =        559
                                                  LR chi2(8)        =     108.64
                                                  Prob > chi2       =     0.0000
Log likelihood = -332.58829                       Pseudo R2         =     0.1404
```

TPP	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Access_Fin_OD	.3288051	.1377119	2.39	0.017	.0588947	.5987155
Access_Fin_CL	.3611832	.1229631	2.94	0.003	.12018	.6021865
Emp_Growth	.5661876	.2035765	2.78	0.005	.167185	.9651902
Sales_growth	-.0417847	.0762001	-0.55	0.583	-.1911342	.1075648
Logsize	.3987316	.1068353	3.73	0.000	.1893383	.6081249
logage	.2700944	.2217722	1.22	0.223	-.1645712	.7047599
RampD	.7598131	.2264013	3.36	0.001	.3160748	1.203551
Fin_Obs	.0238627	.0402988	0.59	0.554	-.0551215	.1028469
_cons	-1.410287	.2779383	-5.07	0.000	-1.955036	-.865538

2. The effect of access to line of credit or loan on TPP

Source	SS	df	MS	Number of obs	=	559
				F(7, 551)	=	12.29
Model	6.90685743	7	.986693918	Prob > F	=	0.0000
Residual	44.2370041	551	.080284944	R-squared	=	0.1350
				Adj R-squared	=	0.1241
Total	51.1438616	558	.091655666	Root MSE	=	.28335

Emp_Growth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
TPP	.0752275	.0260161	2.89	0.004	.0241247	.1263303
Access_Fin_OD	.0428321	.0300306	1.43	0.154	-.0161564	.1018205
Access_Fin_CL	.0230285	.0269048	0.86	0.392	-.02982	.0758771
Sales_growth	.0961343	.0151892	6.33	0.000	.0662986	.1259701
Logsize	-.0013954	.0226806	-0.06	0.951	-.0459465	.0431556
logage	-.2390187	.0454958	-5.25	0.000	-.3283852	-.1496522
Fin_Obs	.000896	.0085612	0.10	0.917	-.0159206	.0177125
_cons	.2899567	.0559203	5.19	0.000	.1801135	.3997998

3. The effect access to finance on TPP

```
. probit TPP Access_Fin_CL Logsize logage RampD

Iteration 0:   log likelihood = -392.62547
Iteration 1:   log likelihood = -347.58167
Iteration 2:   log likelihood = -347.46917
Iteration 3:   log likelihood = -347.46914

Probit regression                                 Number of obs     =        567
                                                  LR chi2(4)        =      90.31
                                                  Prob > chi2       =     0.0000
Log likelihood = -347.46914                       Pseudo R2         =     0.1150

------------------------------------------------------------------------------
         TPP |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Access_Fin_CL |   .4728627   .1127167     4.20   0.000     .2519421    .6937833
      Logsize |   .4686877   .1004048     4.67   0.000     .2718978    .6654775
       logage |   .0896703   .2096048     0.43   0.669    -.3211475    .5004881
        RampD |   .8021098   .2226228     3.60   0.000     .3657771    1.238443
        _cons |  -1.134286    .227741    -4.98   0.000     -1.58065   -.6879217
------------------------------------------------------------------------------
```

4. The effect of Access to finance and TPP on employment growth

```
. reg Emp_Growth Access_Fin_OD Access_Fin_CL TPP Sales_growth Logsize logage RampD Fin_Obs

      Source |       SS           df       MS      Number of obs   =       559
-------------+----------------------------------   F(8, 550)       =     10.77
       Model |  6.92924522         8  .866155653   Prob > F        =    0.0000
    Residual |  44.2146163       550  .080390212   R-squared       =    0.1355
-------------+----------------------------------   Adj R-squared   =    0.1229
       Total |  51.1438616       558  .091655666   Root MSE        =    .28353

------------------------------------------------------------------------------
  Emp_Growth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Access_Fin_OD |   .0419833   .0300933     1.40   0.164    -.0171285    .1010952
Access_Fin_CL |   .0223448   .0269536     0.83   0.407    -.0305997    .0752894
          TPP |   .0731903   .0263178     2.78   0.006     .0214946     .124886
 Sales_growth |   .0960875   .0151994     6.32   0.000     .0662316    .1259435
      Logsize |  -.0035854   .0230718    -0.16   0.877    -.0489049    .0417342
       logage |  -.2386928   .0455298    -5.24   0.000    -.3281264   -.1492591
        RampD |   .0229131    .043419     0.53   0.598    -.0623743    .1082006
      Fin_Obs |   .0002817   .0086455     0.03   0.974    -.0167005     .017264
        _cons |   .2937501   .0564168     5.21   0.000     .1829313    .4045688
------------------------------------------------------------------------------
```

5. The White test of heteroscodasticity

Source	SS	df	MS	Number of obs	=	559
				F(1, 557)	=	0.07
Model	.023377244	1	.023377244	Prob > F	=	0.7867
Residual	177.678349	557	.31899165	R-squared	=	0.0001
				Adj R-squared	=	-0.0017
Total	177.701726	558	.318461875	Root MSE	=	.56479

e2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
yhat	0	(omitted)				
yhat2	-.0314863	.1163092	-0.27	0.787	-.2599446	.1969721
_cons	.0063549	.0334919	0.19	0.850	-.059431	.0721408