

Statistical Model on Advancement of Micro and Small-Scale Manufacturing Enterprises: The Case Study in Adigrat Town, Tigray, Ethiopia

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Abstract

Markedly, the solemn difficulties to be solved in most semi and urban areas of developing countries like Ethiopia is scarcity of wealth and life style which could be pertained to unemployment and low income. The overwhelming solution that could be taken is advancement of micro-small enterprises as micro and small enterprise sectors are the core engine of economic development for several countries which are given crucial attention by many developing countries of Africa and other contents. The aim of this study was to model the advancement of micro and small-scale manufacturing enterprises in Adigrat Town. The study has employed stratified random sampling technique under cross-sectional research design. Systematic sampling technique was implemented to select 122 out of 387 and 5 core officials. Thus, the study predicted the successful advancement on micro-small-scale enterprises. Out of four factors, access to credit (P-value =0.007) and working premises (P-value =0.008) have shown positive significant effect on the probability of successful advancement of micro-small-scale enterprises. The study generalized that, lack of working premise and lack of access to credit were found as main determinants to predict the advancement on micro-small-scale enterprises in Adigrat Town.

Keywords: Binary Logistics Regression; Employment Size; Growth Performance of MSE; Lack of Credit Access; Work Promises

Introduction

Background of the Study

Developing countries share a set of common difficulties like widespread and continuing poverty, high and intensifying levels of joblessness, hasty population growth, high-income disparity, low and motionless agricultural productivity, low national saving and the likes [1]. A number of sub-Saharan African countries adopted poverty reduction strategies that primarily emphasize the advancement of MSEs as a key means to reduce scarcity predominantly among the urban dwellers [2].

Micro and small enterprise sectors are the core engine of economic development for several countries which has given crucial attention by many developing countries of Africa and other continents [3]. The role of Micro and Small Enterprises (MSEs) in socio-economic development as a means for generating sustainable employment and income is increasingly recognized. In developing countries, the MSE sector is the largest source of employment and income generation activity, particularly for the urban population [4]. Nowadays, in almost all economies of the world, MSEs are becoming a crucial and key factor for sustained growth and development and becoming the lifeblood of most economies [5].

Ethiopian national government distinguishes the worth of this sector and has undertaken the advancement of MSEs as one of the chief strategies for guaranteeing socio-economic development in the country. Hence, the government drafted its first MSEs development strategy in 1997 and established a micro and small-scale development agency Addis ReMSEDA¹ [6]. The foremost objective of this sub-sector is to play a significant role in the national development activities, particularly, in the creation of employment opportunities and poverty reduction.

The survey study of CSA in 2007 has shown that Ethiopia, MSEs are the second largest employment generating sector next to

¹Seyoum A, Aragie M, Tadesse D (2016) Growth of Micro and Small Enterprises in Addis Ababa City Administration: A Study on Selected Micro and Small Enterprise in Bole Sub City. IJSRP 6: 581-90

agriculture; more than 1.3 million people in the country are engaged in the MSEs sector [7-9]. According to the Tigray Regional State Bureau of Plan and Finance (TRBPF) report in 2010 concerning Northern Ethiopia, Tigray regional state, Abay, *et al.*, noted that around 137,500 people are engaged in the sector. Likewise, in our case, the study area, which is in Adigrat Town also about 10,914 peoples out of 76,400, are engaged in a similar sector. However, a large number of MSEs are unable to grow (expand in terms of employment) and remain to be survival (non-growing) type which cannot provide employment. This is due to the existence of multi-dimensional problems that hinder the firms' profitability and performance for future survival and growth. This situation, in turn, limits the potential gain that could be generated from the sector [10].

According to the Tigray Regional State Bureau of Plan and Finance (TRBPF) report in 2010, in the former years, a five year /2006-2010/ strategic plan has been designed with the objective of fast-tracking the overall economic expansion of Tigray regional state. This plan has been employed thoroughly but after the Mid-term evaluation of the strategic plan, its period was reduced into four years /2006-2009/. As a consequence, inspiring achievements have been recorded on the economic, social, and development of democratic system guaranteeing good governance. On the other hand, in the process of safeguarding speedy economic expansion of Tigray regional state, the upsurge of the price of different merchandises has occurred. Thus, in the latter five years development plan, the focus has been given to both upholding and enhancing the achievements and resolving challenges coming across in the former five development plan. The latter development plan was named as a five years /2010-2014 / Growth and Transformation Plan (herein after referred to as GTP) for it, on one hand, facilitates the requirements to launch to industry led economy and, on the other hand it wholly sustains nourishment security through maximizing the agricultural productivity led economy. The GTP was framed based on performance appraisal of the former 5 years strategic plan /2006-2010/ and planning framework provided by the federal government.

According to Sapovadia as per 'Doing Business Report 2015² published by the World Bank Group'; Ethiopia was ranked 132nd with distance to frontier (DTF) scores of 56.31. The internal factors to arrive on aforesaid rank & score disclosed that Ethiopia unwell achieved on preliminary commercial, trading across boarder, access to credit, protection of minority investors, paying taxes and registering property [11].

Furthermore, another research³ has shown that 68% capital of SMEs come from personal or group savings of the promoters. The study indicated that in terms of education, only 30% of the promoters were Diploma or higher qualification holders. The 92% of the SMEs are sole proprietorship business and less than 10% could speak English language. Only 23% promoters had better marketing skill, an essential skill for success of an enterprise. 55% promoters failed to access finance & marketing and in turn the faced a lot of problems for their success. More than half about 77% of the enterprises could manage by self or with family support.

Recently, Gebreeyesus, *et al.*, stated that, the significance role of MSEs in Ethiopia is expected to drive beyond creating employment for the urban jobless people. Rather, the subdivision is at the focus in flooring the way to generate an industry-led economy [15]. In connection with the hallucination of being a foremost country in Africa in light manufacturing industries by 2025, the manufacturing MSEs have been given excessive weight. Due the fact, the federal implementing agency has been reorganized, which resulted in the replacement of FeMSEDA with two distinct federal agencies: The Federal Small and Medium Manufacturing Industry Development Agency (FeSMMIDA) and the Federal Urban Job Creation and Food Security Agency (FUJCFoSA). FeSMMIDA is accountable to the Ministry of Industry and is mandated to foster small and medium manufacturing enterprises [12-14].

The research programme of Gebreeyesus, *et al.*, identified medium-term detailed activities and work programmes that cover 2016 to 2019. According to Gebreeyesus, *et al.*, the readiness of reliable data is vital in conducting thorough investigation and mainly monitoring [12]. One of the foremost strategic early activities of this project was, therefore, collection of baseline data, taking a sample of 8,000 manufacturing MSEs from the 10 principal cities in Ethiopia (Addis Ababa, Adama, Jimma, Dire Dawa, Jijjiga, Mekelle, Bahir Dar, Gondar, Dessie, and Hawassa). The programme intentions to form longitudinally follow-up data by conducting a prospective follow up survey every 2-3 years. Then deliberately, the baseline survey was held from December 2016 up to May 2017, and generated detail information on a total of 8174 manufacturing MSEs. The survey has been focused on total population of small manufacturing enterprises (with employment of 6-30) and a random sample of micro enterprises (with employment of 1-5). The collected data categorized in terms of size distribution and the data consists of 3310 (40.5%) micro enterprises, 4,553 (55.7%) small enterprises, and 311 medium-size enterprises (>30 employment), where at the time of survey investigation, the employment exceeded 30. Geographically, the capital of Ethiopia which is Addis Ababa had the lion's share of MSEs (55%) and the rest 45% were distributed among the nine other regional cities.

Therefore, the purpose of the study is to assess the major affecting factors of manufacturing enterprises and came up with proper solutions and recommendations in Ethiopia particularly Adigrat Town. Asgedom noted that the enterprises face difficulties in getting loans from the financial institutions due to high collateral requirements and the plant has suffered from the inadequacy of machinery and lack of modern technology [7]. MSEs are constrained by the shortage of skilled labor force, lack of business premises, poor product quality, and the shortage of raw material, lack of business information and training and burden of some bureaucratic and high taxation.

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³Entrepreneurship with Special Reference to the Status of Small Business Entrepreneurship: A Case Study of Gondar, Ethiopia by Friday O Okpara & Ato Davit Mengistie

In Ethiopia, the commercial bank system could not address the financial needs of the poor; this is because they can't put up acceptable collateral. This situation limits the MSEs operators from widening their credit source bases and to expand and enhance their performance.

In general, the problems mentioned above are reflected in the study area, as a whole in other Ethiopian cities. Poverty and unemployment are a serious problem in the city. These barriers adversely affect the profitability of the operators, and in turn, the sector cannot be operated efficiently or expanded for further economic benefits. For this reason, in many cases from the established microenterprises only some grow, some stabilize without changing the scale while the others exit from the business. Several questions could be raised in the minds of authors in the context of the constraints on the successful growth of micro and small-scale manufacturing enterprises. For instance, what are the major internal and external constraints of manufacturing entrepreneurs in Adigrat Town? What are the endorsed overwhelming solutions?

Therefore, the study is mainly to implement the applications of statistical models on the advancement of micro and small-scale enterprises associated to some predictors including lack of access to credit, lack of work permit, uncomfortable working location of enterprises, lack of relevant information and further problems regardless of direct impact on success of Micro and small manufacturing operators in Adigrat Town. Therefore, the main purpose of this study is to identify and examine the influence of predetermined predictors on the successful advancement of micro and small manufacturing enterprises in Adigrat Town.

Objective

The main objective of this study is to apply a widely used statistical model on the advancement of micro and small manufacturing enterprises in the case of Adigrat Town.

The importance and contributions of this paper in academics is that it is expected to demonstrate the influence of entire determinants on the advancement of micro and small-scale manufacturing enterprises. The promotion or advancement of the MSEs can be measured in different ways. For instance, in the recent work of Fissuh & Fissuh Monthly revenue was considered as the key indicator of the promotion of the MSEs in terms of individual holder's income [16].

However, unlike Fissuh & Fissuh, in this paper, we considered the employment size as the best indicator of MSEs' advancement [17]. Hence, this study contributes to academics by granting insightful direction on how to measure the advancement of MSEs. Not only that but also it will create the know-how for society and enterprise owners how to identify the influential factors in the improvement of their business. Likewise, it will play a key role in solving the focal difficulties of how to manage and balance the determinants on the advancement of their enterprises. This, in turn, will be nice guidance for plan developers in drafting the best strategy to achieve their goal in enterprise managing and developing.

The promotion or advancement of the manufacturing enterprises may be measured through different surrogates or indicators namely the change in employment size per years of experience, the change from one scale to other scale (micro to small or small to medium and vice versa), growth in sales, growth in profit, growth in number, growth in market share, new product development, quality of product offered, customer satisfaction and so forth [17,18]. However, due to the limited financial capacity and time, in this paper, we focused only on the employment size of the enterprises to measure the promotion or the advancement of the micro and small-scale manufacturing enterprises in Adigrat Town and in turn, the generalization can be done nationally.

Hypotheses of the Study

The study endeavor to assess the subsequent basic hypotheses of the study

H1: Lack of access to credit has no significant effect on the advancement of business enterprises.

H2: Work premises have no significant effect on the advancement of business enterprises.

H3: The location of an enterprise has no significant impact on the advancement of business enterprises.

H4: There is no significant association between Information about enterprises and the advancement of business enterprises.

The remaining part of this paper is organized as follows. Section 4 reviews the related works. Section 6 introduces the methods and framework which are going to be used in the whole paper. Section 4 talks about the results of binary logistic regressions and a general discussion of the article. Finally, Section 9 presents the conclusions and recommendations of the study.

Literature Review and Related Works

Financial Problem

Lack of capital: The development of small and micro enterprises is hindered by various problems among the problems a lack of capital for commencing, operation and expansion can be mentioned. Small enterprises even at the initial stages just after starting operation do require adequate promotional services; however, most of them cannot afford to purchase due to the capital shortage [19].

Finance is an engine for both new entrants to the sector and existing MSEs Operators. Moreover, Walmobo said that the small enterprises especially at the initial stages just after starting operation do require adequate promotional services, however, most of them cannot afford to purchase due to capital shortage [19]. Different research evidenced that the small firms start their business with their own savings supplemented by borrowing from friends and relatives. Since most of the operators/owners are poor, they start their business with very little capital. A few meet their capital requirements through informal credit mechanisms, which exist within their community, but rarely from the formal sector institutions [12].

Limited Access to Credit: Most of the micro and small enterprises depend on external finance or non-institution. Financial assistance by the various agencies, like financial corporations and commercial banks, often falls much short of their requirements. In order to supplement the institutional finance micro and small enterprises have to approach the unorganized money market at terrible heavy rates of interest or on suppliers' credit on exceedingly unfavorable terms Private finance, ultimately spoil the unit and cause for sickness in the small business [20].

Lack of information about the business: Information about business opportunities, market availability, a supply of raw materials and equipment or any advisory and Consultancy service is difficult to get. The limited public awareness for the need for such information and the limited experience of government in providing those services are two of the main reasons. Small enterprises are lacking technological information, and poor awareness of the latest technological achievements makes them dependent on the information they manage to get from scarce resources and this situation limits their business expansion and growth [19].

Lack of Premises, Land, and Infrastructure: Infrastructure, services such as electricity, telecommunications, transportation, water and sanitation play a critical role in a country's development and therefore, directly and indirectly, linked to small business success and economic growth.

Working place is one of the main affecting factors to MSEs growth. Most of operator lack access for land to produce and sales their goods and services. Several studies focused on the lack of working premises. The study conducted by Wasihun & Paul pointed out that, most of the women do not have their own working premises [4]. Their working place is shared with other members of the cooperative. The study of Siyoum quoted by Abay, *et al.* showed that, MSE operators that secure own working place and buildings are in a better position to plan with greater certainty and stand a better chance of accessing the needed infrastructure and in doing so greatly enhance the growth of such enterprises [10,21].

Other Problems

Various studies explore that, institutional bureaucracy, lack of raw materials, lack of skilled labor, market problem, deficiency and outdated technology, traditional attitude towards the sector, etc. affect the sector adversely not to perform its full potential in socio-economic development.

Countries Experience in MSEs Development

In many developing countries, micro enterprises and small-scale enterprises account for the majority of firms and a large share of employment, mainly consisting of small firms with one person working alone or with unpaid family members. Self-employment is a central element in these economies.

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In many developing countries, microenterprises and small-scale enterprises account for the majority of firms and a large share of employment, mainly consisting of small firms with one person working alone or with unpaid family members. Self-employment is a central element in these economies

Indonesia: Micro, small and medium enterprises (MSMEs) hold a strategic position in the Indonesian economy. It can even be said that they are the backbone of the economy, constituting 98 percent of all business units in Indonesia. MSMEs have the ability to use production resources efficiently, create job opportunities, and improve income distribution. In 2006, the output of MSMEs reached almost 58% of the total Gross Domestic Product (GDP) and absorbed 82% of the total workforce; more than 73 million people [22].

Tanzania: Although the Tanzanian financial system comprises a host of both formal and informal organizations, adequate finance is not being provided to allow for the development of the sector. In both the 1991 and 1995 informal sector surveys, lack of capital was cited as pressing need of the MSE sector operators. The surveys further indicated that working capital (necessary for business growth) was the most needed to be followed by investment capital (for starting up new business). It was established from the surveys that only 5% could obtain credit from Banks, NGOs, and other financing institution, but the rest (95%) were from own saving (66%) borrowing from friends and relatives (12%) and assistance from friends and relative (17%) [22].

According to the literature of Bereket, 81% of the manufacturing establishments in the United States in 1980 had small enterprises with less than 100 employees [23]. These establishments employed 25% of all manufacturing employees and produce 23% of the total

value added by manufacturers. The relative importance of small enterprises in West Germany and the United Kingdom was also greater, 27% and 26% of all manufacturing employees respectively. The percentage of small enterprise employment is even higher like in New Zealand 62 percent, Argentina 52% and Japan 56%. In 2000 China had more than 20.85 million small-scale enterprises, with 128.2 million employees and generating 2,720 billion dollars in added value, and 9.14 percent increase every year of the small-scale enterprises [23]. Therefore, this shows that micro and small enterprises are contributing significantly even in developed countries.

Statistical Analysis

In their study Haile & Batra, intuitively managed to reduce and check reliability and the huge data set on the impact of business development service through factor analysis (FA) [19]. Then they have employed both one-way analysis of variance (ANOVA) and multiple linear regression to assess the effect of the determinants on the MSE's performance and they found that all explanatory variables were statistically significant at 1% ($P < 0.01$). It implies there is evidence to safely accept the hypothesis "the performance of micro and small manufacturing enterprise is not the same in all three categories (high, moderate, and low) of Business Developing Service (BDS) dimensions". In other words, market access ($F = 72.1, P = 0.00$), infrastructure facility ($F = 64.2, P = 0.00$), input supply ($F = 88.7, P = 0.00$), training and technical assistance ($F = 49.3, P = 0.00$), and technology and product development ($F = 45.5, P = 0.00$) were found to be significant at 1% and confirmed that each group (enterprise) has different performance according to their share of a given categorical factor or explanatory variable. Therefore, from these findings, one can infer that all BDS dimensions individually and jointly have a positive and significant relationship with the performance of micro and small manufacturing enterprises.

According to the result of Haile & Batra, all the determinants namely market access (p-value < 0.001), infrastructure facilities (p-value < 0.001) perhaps which is equivalent to location of enterprise and work premises in our case, input supply (p-value < 0.001), training and technical assistance (p-value < 0.001), technology and product development (p-value < 0.001) were statistically significant predictors of performance of MSEs (advancement of MSEs in our case) [19].

The multiple linear regression analysis of Haile & Batra revealed that the data in their specific study fitted the model well, which was confirmed by the F-value 95.861 and significant at (p-value < 0.001) [19]. It implies the relationship between all business development service dimensions that included in the study and micro and small enterprise's performance is statistically significant.

Moreover, in their study, Haile & Batra have found that their regression analysis produced the coefficient of determination R-square (0.568) and adjusted R-square (0.562) that indicated the proportion of variances in the dependent variable accounted for by the explanatory variables of the study [19]. Therefore, they generalized that 56.2% of the variance in the MSE's performance was explained by all five BDS dimensions; whereas, the remaining 43.8% of the change in performance was explained by other factors that were not considered in the study.

Furthermore, Gebremichael studied the impact of subsidy on the growth of small and medium enterprises (SMEs) [20]. His result showed that SMEs generating more employment compare to large firms. He has put "the government's conducive policy to support and encourage SMEs" as the main reason. His study revealed that the government is well attentive of the positive contribution that micro, small and medium enterprises (SMEs) can play in the economic growth and development and encourages them through providing different supports, their dependency level is increasing. His meant referred that it was due to the reason that the government's support to SMEs declines gradually when they show growth from micro to small, small to medium and medium to large enterprises.

Thus, they don't have any incentive to grow more, rather results in dependency. With regard to SMEs contribution towards industrialization, his study has come up with the result that when there is a high proportion of SMEs product for further production, their contribution to industrial growth is expected to be high. In his linear regression analysis, he found that the SMEs' initial capital, credit accessibility, linkage, and technology have significantly affected SMEs employment growth positively. In addition, cooperatives did have higher average sales growth than others did. According to his results, the same was true for SMEs operating in the construction sub-sector. He also stated that according to the group discussion with key informants, the study reached into the conclusion that access to credit and need-based training was other important determinants of small business growth and sustainability.

Conceptual Framework and Study Variables

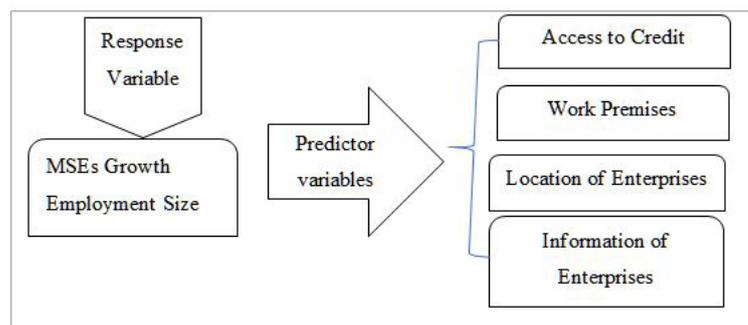


Figure 1: Conceptual Frameworks

Methods

Target Population

The target population of this study has covered from two kebeles' micro and small manufacturing enterprises and from the MSE governmental officials and head municipal of the Town. The reason why the researcher has drawn the target population from two kebeles such as 02 and 04 was that purposively based on a number of operators and diversity of businesses in each kebele. In addition to this core, persons from MSE governmental officials and head of the city municipal were selected purposively for an interview, as they are the key informants to the research.

Research Design

Cooper and Schindler defined research design as the plan and structure of investigation so conceived as to obtain answers to the research questions [24]. Moreover, Kothari contends that the research design describes the arrangement of conditions for collection and analysis of data, bringing together the relationship and rationale of the study as a means to achieve the research objectives using empirical evidence obtained economically [25]. In summary, research design is a master plan that specifies the methods and procedures for collecting and analyzing the needed information [17].

The emphasis of the study was conducted a descriptive survey type of research to evaluate the advancement of micro and small manufacturing enterprises conditional to the predetermined predictors in Adigrat Town. The descriptive and correlational research design has been conducted. The stratified sampling techniques in six different manufacturing enterprises (strata). The stratification has been done with the assumption of heterogeneity among strata and homogeneity within stratum. The data was collected cross-sectionally at one time point with short period. The simple random sampling techniques have been employed inside the stratified sampling. The lottery method was adopted to select individual participants or respondents. Therefore, out of the total 387-target population, 122 respondents and 5 persons from the MSE governmental officials and head of the Town municipal i.e.; totally 127 respondents have been taken using systematic sampling techniques from each stratum based on the sampling list frame of formally registered MSEs until September 2016 under MSEs office of Adigrat Town.

In any research, different sources of data are implemented to respond to the research questions correctly. For this study, the researcher has used both primary and secondary data sources. The main source of primary data was micro and small enterprises survey. The potential source of primary data was collected by distributing a well-administered questionnaire to all respondents of MSEs and recollected by the investigator. Because questionnaires are an effective mechanism to gather a huge amount of information in a short period of time, in minimum cost and will make it easy in handling and interpreting the results of the study [16,17].

The well-administered questionnaires were distributed to the respondents in a systematic way to minimize subjective biases. Accordingly, both open and close-ended questionnaires have been included. The researcher has tested the questionnaire by distributing to the sampling group (about 20 persons) and made sure their appropriateness. In the case of secondary data, the researcher particularly used official reports of Zone and Town governmental institutions, and different literature like related articles, magazines and journals, e-books and library like proclamations and policy papers.

During data analysis, the researcher has utilized both qualitative and quantitative; however, a more focused method of data analysis for this study was the quantitative data analysis. For processing and analyzing data collected from the respondents, the researcher has utilized SPSS software and Microsoft Excel to make an easy analysis. Therefore, to observe and overview respondents' perception and their level of agreement or disagreement with the given statement, the general features of the data on each variable has been analyzed using both descriptive and inferential statistics. Descriptive statistics is a part of statistics that describes or explains the characteristics of sample data without generalizations or drawing conclusions about the characteristics of populations.

The techniques most of in used for describing the characteristics of the sample and the major study variables are displayed in the form of frequency distribution, percentage, proportion, and diagrammatic representation such as bar chart, pie chart etc. Inferential statistics is a statistical method deals with making inferences or conclusions about a population based on data obtained from a limited number of observations that come from the population. Inferential statistics consists of estimation and hypothesis testing [16,17]. Therefore, to measure the success of micro and small enterprises conditional to challenging factors, the main indicator variable showing the trend of advancement in MSE is proposed.

Finally, the relevant and most widely used statistical model so-called binary logistic regression for dichotomous response was applied to assess the relationship between the response (MSE has been advanced (success) and MSE has not been advanced (Failure)), which are the indicators of advancement in MSEs and predetermined covariates or predictors.

Multiple Linear Regression Models

The most widely and commonly used linear regression analyses are multiple linear regression models. As a predictive analysis, the multiple linear regressions are used to explain the relationship between one continuous dependent variable and one or more independent variables [26]. Hence, in this paper, the response variables with MSEs growth in terms of employment size on the four predictors will be systematically analyzed.

Therefore, for dependent variable MSEs growth in terms of employment size, the usual multiple linear regression model will be fitted as formulated here below.

$$Y_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \epsilon_i,$$

Where Y_i dependent variable, β_i 's are unknown parameters, X_{ki} are fixed known independent variables and $\epsilon_i \sim N(\mu, \sigma^2)$ random errors $k = 1, 2, \dots, 11$ & $i = 1, 2, \dots, n = 122$.

Therefore, the fitted version of the multiple linear model will be estimated as $E(Y_i) = \hat{Y}_i = b_0 + b_1 X_{1i} + b_2 X_{2i} + \dots + b_k X_{ki}$.

Therefore, the random error is $\epsilon_i = Y_i - \hat{Y}_i$. Thus, the commonly used estimating method for regression least square method will be used by minimize the sum square error to estimate the optimal estimate of the unknown coefficients as

$$\frac{\partial}{\partial \beta_i} \sum_{i=1}^n \epsilon_i^2 = \frac{\partial}{\partial \beta_i} \sum_{i=1}^n (Y_i - \hat{Y}_i)^2 = \frac{\partial}{\partial \beta_i} \sum_{i=1}^n (Y_i - b_0 + b_1 X_{1i} + b_2 X_{2i} + \dots + b_k X_{ki})^2 = 0.$$

General Concept: Linear Regression is a process that allows you to make predictions about variable “Y” based on knowledge you have about variable “X”. The Correlation Coefficient is a single summary number that tells you whether a relationship exists between two or more variables, how strong that relationship is and whether the relationship is positive or negative (direction of relationship). The Coefficient of Determination is a single summary number that tells you how much variation in one variable is directly related to variation in another variable. The Standard Error of Estimate is a single summary number that allows you to tell how accurate your predictions are likely to be when you perform Linear Regression [16,17,26].

Binary Logistic Regression Models

For brevity and clarification, it is better to define the dichotomous response that is the indicator of advancement in MSE before talking about the binary logistic regression model. Therefore, in this paper, the employment size is considered as the measure of MSE advancement. In developing countries, obviously, there is lack of technology. Thus, to compensate the role of technology, the micro and small-scale sectors use human power. In such circumstances with lack of technological environment, the main engine of the economic development is human power. Thus, when the MSEs enterprise increases in supply and demand it is must to increase the employment size. Thus, the MSE advancement rate is defined as the difference in employment sizes i.e.; current employment size minus initial employment size divide to the experience of the respective MSE firm and is formulated as:

$$MSE.Ad_{rate} = \frac{CES - IES}{Exp} \tag{1}$$

Consequently, by taking the calculate advancement rate in the cut point for the indication of significant advancement or promotion (success) is defined as the computed MSE advancement rate greater than zero ($MSE.Ad_{rate} > 0$).

$$MSE.Ad = \begin{cases} 1, \text{if } MSE_{rate} > 0 (\text{Success to MSE advancement}) \\ 0, \text{if } MSE_{rate} \leq 0 (\text{Failure to MSE advancement}) \end{cases} \tag{2}$$

Therefore, based on the defined dichotomous response variable, the well-known and most relevant statistical model for binary outcome so-called binary logistic regression is used to test the relationship between the dichotomous response (MSE advancement) and associated challenging covariates or predictors. Binary logistic regression is one of the statistical models for dichotomous response variables having two categories success or failure, presence or absence or yes or no and forth [27]. For response variable or binary outcomes which is $MSE.Ad = Y_i$ given as:

$$Y_i = \begin{cases} 1, \text{if success (MSE has been advanced)} \\ 0, \text{if Failure (MSE has not been advanced)} \end{cases} \tag{3}$$

$$P(Y_i = 1) = \pi_i = \frac{\exp(\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki})}{1 + \exp(\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki})} \quad (\text{Logistic model}) \tag{4}$$

$$P(Y_i = 0) = 1 - \pi_i = \frac{1}{1 + \exp(\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki})} \tag{5}$$

Where β_o and β_i are parameters to be estimated. π_i the probability that Y_i equals one as we will see shortly, β_o constant (intercept)

and β_i is the regression coefficient (slope), which measures the rate of change in π_i for a given change in X.

The parameter β_i determines the rate of increase or decrease in the S-shaped Curve. Positive values of β_i imply that π_i increases with x, negative values of β_i imply that π_i increases when x decreases. $\beta_i = 0$ implies no relationship between the explanatory variable x and the probability of success π_i . The probability that $Y_i = 1$ relative to the probability that $Y_i = 0$ equal to $\frac{\pi_i}{1-\pi_i}$ which is known as Odds. If the odds are >1 , then the probability that $Y_i = 1$ is greater than the probability that $Y_i = 0$; if the odds are <1 , then the converse is true. If we take the natural log of the odds $Y_i = 1$: $\ln\left(\frac{\pi_i}{1-\pi_i}\right)$ which is called Logit. This is the logit transformation or link function that we will term $g(X)$, and which can be modeled against our predictor much more easily as [25].

$$\log it(\pi_i) = \ln\left(\frac{\pi_i}{1-\pi_i}\right) = g(X) = E\{Y_i\} = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} \quad (6)$$

The ratio of the two odds is called the odds ratio.

$$OR = \frac{p(y=1)}{p(y=0)} = \frac{\pi_i}{1-\pi_i} = e^{\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}}$$

$$\frac{p(MSE\ advanced\ successfully\ (y=1))}{p(MSE\ has\ not\ been\ advanced\ (y=0))} = \frac{\pi_i}{1-\pi_i} = e^{\beta_0 + \beta_1 ACC + \beta_2 LOE + \beta_3 SHAD + \beta_4 LIF}$$

$$\log it(\pi_i) = \ln\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 ACC + \beta_2 LOE + \beta_3 SHAD + \beta_4 LIF.$$

This is telling us that β_i represents the change in the odds of an outcome for an increase in one unit of X. The constant, β_0 is the value of $g(X)$ when $X_i = 0$ and represents the intercept of the logistic regression model; its interpretation is similar to the intercept of the linear regression model [27].

Moreover, in short, the one dichotomous and 4 predictor variables taken for binary logistic regression in this paper are organized in Table 1.

| Name of Variables | Measurement Scale | Category levels |
|------------------------------|--------------------------|---|
| MSE.Ad indicator | Nominal (Dichotomous) | 1= MSE has been advanced, 0= MSE has not been advanced |
| Access to credit (ACC) | Nominal | 0= Not Available (No), 1= Available (Yes) |
| Location of Enterprise (LOE) | Nominal | 0= Not suitable, 1= Suitable |
| Work Premise (SHAD) | Nominal | 0= Not Available (No), 1= Available (Yes) |
| Lack of Information (LIF) | Nominal | 0= Has no information (No), 1= Has Enough Information (Yes) |

Table 1: Variable Descriptions for Binary Logistic Regression

Sample Size Determination

The selection of sample size depends on the type, objectives, significance, and findings of the study. Due to lack of time, resources and cost, it is usually impossible to take and manage the whole population as it is. Keeping this in mind, the sample size has been taken using sample size determination formula, which is developed by Yamane $n = \frac{N}{1 + N * e^2}$ where, n is the desired total sample

size, is total population size and is a margin of error, which is common, called sampling error and has taken as 0.075 [28]

Findings and Discussion

Findings

Data Descriptions and General Characteristics: In this section, the researcher has interpreted and summarized the findings such as the influence of the independent variables, Observations, and attitudes in order to achieve the appropriate conclusions and forwarding possible recommendations.

This study generally deals with modeling binary logistic regression to assess the success in the advancement of micro and small enterprises conditional to the predetermined predictors in Adigrat Town, Tigray, Ethiopia. The study was done based on the relevant literature dealing with MSEs. The descriptive and correlational research design with cross-sectional data collection design was applied in a careful investigation about the affecting factors of MSEs. Particularly, the study is conducted in manufacturing enterprises in Adigrat Town. Generally, after the careful and intentional collection of data, the investigator has come up with well-organized methodological and empirical results.

The results of this study are based on the objectives and analysis of the sample answers of the respondents from MSEs Operators and management bodies. The result incorporated both descriptive and inferential statistics accompanied by empirical analysis and are organized in respective tables and graphs. The careful interpretations, discussions, and conclusions were conducted.

Frequencies and Percentages: Table 2 illustrates the frequencies and percentages of growth of employment against the predictors. Out of the total manufacturing enterprise (122), 16.4% of the enterprises who had no access to credit did not grow in employment size; whereas only 0.8% of the enterprises who had access to credit did not grow in employment size. In contrast, 38.5% of the enterprises who had no access to credit did grow in employment size whereas 44.3% of the total enterprises who had access to credit did grow in employment size. This in general implies the enterprises that have enough access to credit have advantage of growing their MSEs in terms of employment size than those who have no access to credit.

Likewise, 8.2% of the enterprises who had no working premises or shade did not grow in terms of employment size; whereas 9.0% of the enterprises who had working premises or shade did not grow in terms of employment size. In contrast, 10.7% of the enterprises who had no working premises or shade did grow in terms of employment size; whereas 72.1% of the enterprises who had working premises or shade did grow in terms of employment size. The rest predictors can be explained in the same fashion. For further details see in Table 2.

| | | (NCE-NIE)/Exp=MSE growth in Employment (Cut Point=0) | | | | | | | | | |
|-------------------------------|--------------|--|---------|------------|-----------|---|---------|------------|-----------|-------|-----------|
| | | No Growth in Employment (MSEgr<=0) | | | | There is Growth in Employment (MSEgr>0) | | | | Total | |
| | | Count | Row N % | Column N % | Table N % | Count | Row N % | Column N % | Table N % | Count | Table N % |
| Access to Credit | No | 20 | 29.9 | 95.2 | 16.4 | 47 | 70.1 | 46.5 | 38.5 | 67 | 54.9 |
| | Yes | 1 | 1.8 | 4.8 | 0.8 | 54 | 98.2 | 53.5 | 44.3 | 55 | 45.1 |
| Location of Enterprise | Not Suitable | 18 | 20.2 | 85.7 | 14.8 | 71 | 79.8 | 70.3 | 58.2 | 89 | 73.0 |
| | Suitable | 3 | 9.1 | 14.3 | 2.5 | 30 | 90.9 | 29.7 | 24.6 | 33 | 27.0 |
| Working Premise | No | 10 | 43.5 | 47.6 | 8.2 | 13 | 56.5 | 12.9 | 10.7 | 23 | 18.9 |
| | Yes | 11 | 11.1 | 52.4 | 9.0 | 88 | 88.9 | 87.1 | 72.1 | 99 | 81.1 |
| Lack of Information | No | 7 | 13.0 | 33.3 | 5.7 | 47 | 87.0 | 46.5 | 38.5 | 54 | 44.3 |
| | Yes | 14 | 20.6 | 66.7 | 11.5 | 54 | 79.4 | 53.5 | 44.3 | 68 | 55.7 |

⁴Sources: Own Survey data (2017).

Column N% refers the percentage employment size increase within the categories or levels of predictors e.g. 95.2% implies 20/21*100=95.2% of non-growth of employment size is associated to no access to credit. Row N% refers row-wise percentage associated to either growth or non-growth of the employment size within each level of the predictors; e.g. 29.9% refers, 20/67*100=29.9% of the enterprise that do not access to credit could not grow in employment size. However, Table N% refers the percentage of the enterprise's growth in employment size per each predictor level out of the total enterprises; e.g. 16.4% =20/122*100.

Table 2: Descriptive Statistics for Predictors versus Response Variable

Demographic Factors: Furthermore, Table 3 describes and compares the frequencies and percentages of sex, age and marital status who are involved in enterprises by educational level. Hence, according to the gender division of the enterprises, it is certain that men outnumber the women as owners and operators of micro and small enterprises in the given survey. As indicated in Table 3, among the total sample size 122 included in the analysis, 112(91.80%) of the business operators were male and 10(8.20 %) were female owners of the business. This shows that male-owned operators dominate the enterprises. Therefore, there is certainly a dominance of men in the sample, yet it cannot be concluded that sex is an important indicator of success, regardless of the economic sector. However, there are certain factors related to an unequal opportunity that have a negative effect on women's chances of expanding their business.

This indicates that the sector needs to provide better attention to female workers in order to increase the outdoor employment opportunities they lack so far, especially in the manufacturing sector.

Education versus Age of respondent: The data collected from the sample survey concerning their educational background shows 99 (99.18%) of the micro and small enterprise owners attended formal education and only one (0.82%) did not attend formal education. The result of the comparison of age and educations on the above table shows interesting facts. The fact shows, 76.2% of the entrepreneurs were in the age category of 15-35 (93 in numbers), they are attending above grade five up to Post Graduate, and 14 of them are degree holders. The contribution from the educational level lower than grade 5 is 11 operators that mean 10 of them

are below grade 5 and 1 is Illiterate, the results show that at least middle level of education is important to become entrepreneurs. In addition to this Majority of the entrepreneurs are young in between 15 to 35 years old (93 out of 122 respondents), which are in the age of active labor force population. This implies that younger generations are coming up to the business. The small proportion of the entrepreneurs which constitutes 4.9 % were in the age category of above 50 years; in which these people are most of the risk-averse activity in their venture than participate in this business activity.

Marital statuses: The marital status of respondents indicates which group of the society are benefiting from micro and small enterprises. As shown in Table 3, 53(43.4%) of the respondents are found to be single, 64(52.4%) married, 3(2.4 %) divorced and 2(1.6%) widowed. The Figure shows that the program has absorbed mainly single and married men and women (Table 3).

| | | | Educational Level | | | | | | | Total |
|----------------|----------|-----------|-------------------|--------|--------|--------|---------|----------|---------------|-------|
| | | | Illiterate | 01-Apr | 05-Aug | 09-Dec | Diploma | Bachelor | Post Graduate | |
| Sex | Female | Count | 0 | 1 | 2 | 2 | 4 | 1 | 0 | 10 |
| | Male | Count | 1 | 10 | 27 | 47 | 12 | 13 | 2 | 112 |
| | Subtotal | Count | 1 | 11 | 29 | 49 | 16 | 14 | 2 | 122 |
| | | Table N % | 0.8 | 9 | 23.8 | 40.2 | 13.10% | 11.50% | 1.6 | 100 |
| Age | 15-35 | Count | 0 | 7 | 15 | 42 | 15 | 12 | 2 | 93 |
| | 36-50 | Count | 0 | 2 | 11 | 7 | 1 | 2 | 0 | 23 |
| | >50 | Count | 1 | 2 | 3 | 0 | 0 | 0 | 0 | 6 |
| | Subtotal | Count | 1 | 11 | 29 | 49 | 16 | 14 | 2 | 122 |
| | | Table N % | 0.8 | 9 | 23.8 | 40.2 | 13.1 | 11.5 | 1.6 | 100 |
| Marital Status | Single | Count | 0 | 2 | 5 | 27 | 10 | 8 | 1 | 53 |
| | Married | Count | 1 | 8 | 24 | 20 | 5 | 6 | 0 | 64 |
| | Divorced | Count | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 3 |
| | Widowed | Count | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 |
| | Subtotal | Count | 1 | 11 | 29 | 49 | 16 | 14 | 2 | 122 |
| | | Table N % | 0.8 | 9 | 23.8 | 40.2 | 13.1 | 11.5 | 1.6 | 100 |

Table 3: Distributions of Operators by Sex, Age, Education and Marital Status

Encountered Problems: Figure 3 illustrates the frequently encountered problems to the individuals being stayed without a job. Therefore, the bar chart shows that lack of capital is the most common challenge of several individuals referring about 43(35.25%) individuals out of total 122 was being stayed without a job due to the lack of capital. Furthermore, lack of technical skill and lack of job opportunity are second and third serious challenges with the percentage of 36(29.51%) and 30(24.59%) out of 122 respectively whereas, lack of interest to work is relatively less occurred challenge with few numbers of 13(10.66%) out of 122. Generally, someone can easily understand from Figure 2, that regardless of the problems, about 90% (35.25% +29.5% + 24.59%) of the respondents had been interested to take part in the business (Figure 2).

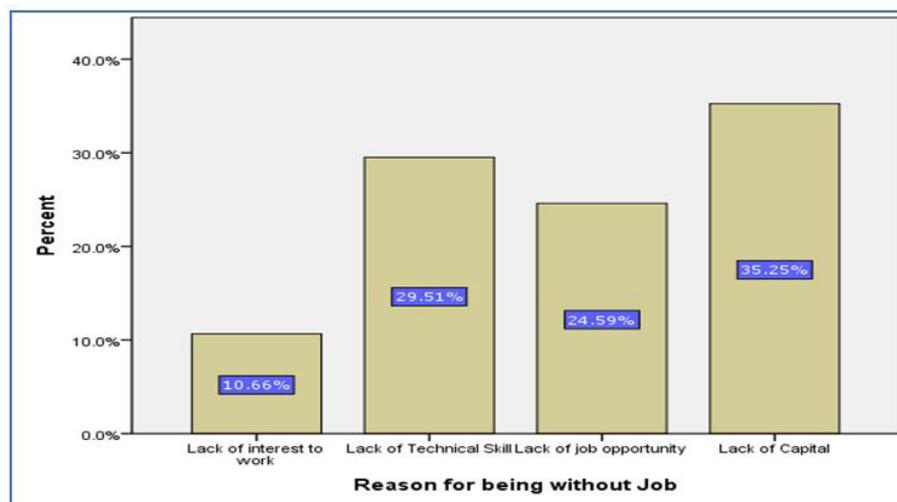


Figure 2: Reasons for being stay without business
(Sources: Own Survey data, 2017)

As it is clearly illustrated in Figure 3, 52.33% of the entrepreneurs reported that high-interest rate is the main constraints of the enterprises to get a loan. The second highest that is about 36.06% of them responded that lack of collateral is the problem; this

is due to the government to establish prohibitive collateral conditions. Thus, most MSEs cannot afford it. The rest 6.98% and 4.65% operators responded that inadequate loan amounts and High bureaucratic structure respectively contribute also the main problems that hinder on the process of getting credit in the city. Beside to Figure 3 the findings displayed in Table 3 indicated that 55.7% of the respondents out of the total 122 complained that the loan from the financial institution is inadequate (Figure 3).

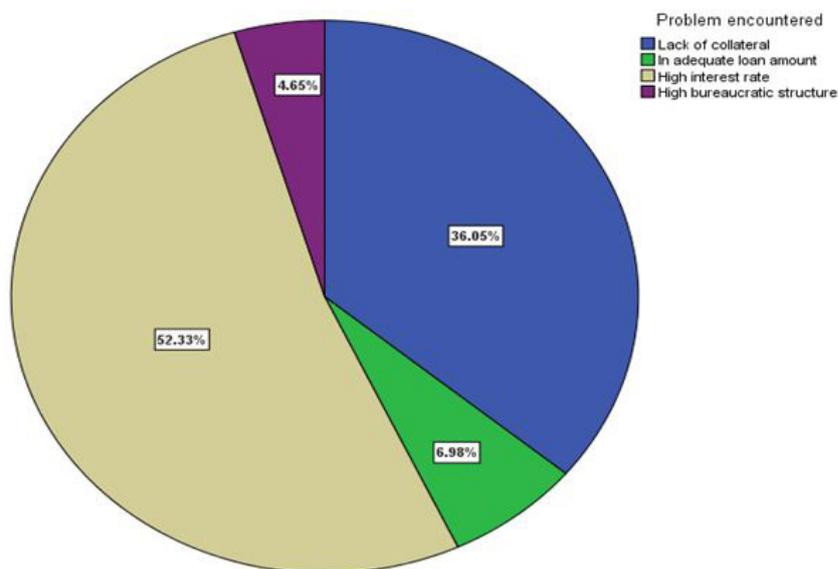


Figure 3: Problems to get Loan
(Sources: Own Survey data, 2017)

Financial Support: Table 4 illustrates the adequacy status of loan which was given from different financial institutions. Out of the total respondents, more than half 55.7% were dictated that the given loan was not adequate for the entire business. The researcher tried to verify whether the problems revealed in Figure 2 and 3 were really found on the ground or not. To do this, an attempt was made to ask the respondents about the type of support they have been offered by the government, by NGOs, and other stakeholders as displayed in Table 4.

| LAFI | Frequency | Percent | Cumulative Percent |
|-------------|-----------|---------|--------------------|
| No adequate | 68 | 55.70 | 55.70 |
| Adequate | 54 | 44.30 | 100.00 |
| Total | 122 | 100.00 | |

Table 4: Loan getting from Finical Institutions

Training: According to Table 5, 54.1% of the MSE owners said that they were given training support; 30% of them revealed that they were provided technical and information support and only 8.2% of the respondents said they were gotten space to run their business by the government. Nevertheless, the rest supports like provision of a market to sell their products, financial, and others are almost negligent accounting insignificant proportions of 3.3%, 3.3%, and 0.8% respectively (Table 5).

| Type of Support | | Frequency | % | Valid % | Cumulative % |
|-----------------|---------------------------|-----------|-------|---------|--------------|
| Valid | Training | 66 | 54.10 | 54.10 | 54.10 |
| | Technical and information | 37 | 30.30 | 30.30 | 84.40 |
| | Market provision | 4 | 3.30 | 3.30 | 87.70 |
| | Financial | 4 | 3.30 | 3.30 | 91.00 |
| | Space to run business | 10 | 8.20 | 8.20 | 99.20 |
| | Others | 1 | 0.80 | 0.80 | 100.00 |
| | Total | 122 | 100 | 100 | |

Table 5: Percentage of MSE owners and types of government support

Capital and Financial source: As it is clearly indicated in Figure 4, the bar chart illustrates a large proportion of capital for the business commence which, accounts about 79(64.75%) of the total was from the personal saving financial source. The second largest financial source which accounts for about 24(19.67%) and 10(8.2%) of the total were gained from relative support and loan from the relatives. Therefore, the Figures show that the main initial source of finance for micro and small business enterprises in

Adigrat Town comes from the family donation covering 92.62% of the total enterprises' initial capital. Thus, the data shows that credit access for startup capital for a formal financial institution is relatively rare.

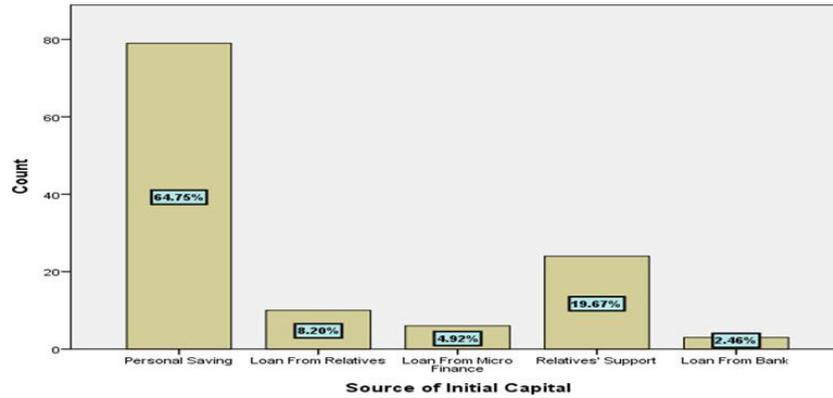


Figure 4: source of initial capital (Sources: Own Survey data, 2017)

Access to Credits: In this study survey, the MSEs obtained credit from a formal financial institution such as microfinance and Bank loans accounted for an insignificant proportion of 6(4.92%) and 3(2.46%) respectively. In addition to this, the study indicates that there is No NGO to support MSEs in starting up a level.

Results

Results of Multiple Linear Regression

According to the results of multiple linear regression in Table 6, working premises (SHADE) (P-value=0.003) and location of the enterprise (P-value = 0.006) are statistically significant predictors of MSEs growth. However, access to credit (P-value = 0.051) is at cut point statistically significant predictor of MSEs at 5% level of significance but it is significant at 10% level of significance. In contrast, Lack of information is negatively associated to MSEs yet it is not statistically significant predictor (P-value = 0.725) of MSEs at 5% level of significance. In general, access to credit and location of enterprises are positively associated with MSEs;

| Model | | Coefficients ^a | | | | | | | | |
|---------------|---------------------------------|-----------------------------|-------------------|----------------------------|---------------|---------------------------------|--------------------|-------------------------|-----------|-------|
| | | Unstandardized Coefficients | | Standardized Coefficients | | 95.0% Confidence Interval for B | | Collinearity Statistics | | |
| | | B | Std. Error | Beta | t | Sig. | Lower Bound | Upper Bound | Tolerance | VIF |
| 1 | (Constant) | 1.108 | 0.248 | | 4.471 | 0 | 0.617 | 1.599 | | |
| | SHADE(Yes) | -0.828 | 0.277 | -0.289 | -2.989 | 0.003 | -1.378 | -0.279 | 0.788 | 1.269 |
| | Access to credit (Yes) | 0.543 | 0.275 | 0.194 | 1.973 | 0.051 | -0.002 | 1.089 | 0.764 | 1.309 |
| | Suitable Location of Enterprise | 0.765 | 0.272 | 0.244 | 2.809 | 0.006 | 0.225 | 1.304 | 0.981 | 1.019 |
| | Lack of Information (Yes) | -0.087 | 0.248 | -0.031 | -0.353 | 0.725 | -0.578 | 0.403 | 0.949 | 1.054 |
| Model Summary | | | | | | | | | | |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson | | | | | |
| 1 | 0.369 ^a | 0.136 | 0.107 | 1.32275 | 1.929 | | | | | |
| ANOVA | | | | | | | | | | |
| | Model | Sum of Squares | Df | Mean Square | F | Sig. | | | | |
| 1 | Regression | 32.302 | 4 | 1.750 | 8.076 | 4.615 | 0.002 ^b | | | |
| | Residual | 204.711 | 117 | | | | | | | |
| | Total | 237.014 | 121 | | | | | | | |

^aDependent Variable: MSE Growth defined by number of employees

^bSources: Own Survey data (2017).

Table 6: Multiple Linear Regression for MSEs growth (Employment size change divide years of Experiences for Manufacturing Enterprises)

*P<0.05
 **P<0.01
 ***P<0.001

whereas, working premises and lack of information are negatively associated with MSEs.

The overall result of ANOVA for multiple linear regression in Table 6 have shown the statistical significance (P-value = 0.002). Even though the overall result shows statistical significance, the small values of $R = 0.369$, $R\text{-square} = 0.136$, and $R\text{-adjusted} = 0.107$ may show the relationship between MSEs and enter predictors are weak. Moreover, the model seems poor fit. Likewise, the value of the standard error for estimate is equal to 1.32 which the measure of precision is seems high by indicating lack of precision in estimate. Perhaps the result indicates the failure of all or some assumptions. Therefore, it is must to check the assumptions before general conclusions are given on this result. We cannot rely on this result before the assumptions are tested.

Based on the results in Table 6, the absence of multicollinearity is achieved with small $VIF < 5.0$. The next step is to test autocorrelation of residuals. This can be tested by using Durbin-Watson statistic whose values range from 1 up to 4 and the values less than 1 and above 3 are indication of autocorrelations. Therefore, we always need the value of Durbin-Watson statistic to be close to 2. In our case this assumption is met with Durbin-Watson statistic=1.929.

The series assumption that must be given attention is normality test and homoscedasticity test. These tests shall be shown by Normal P-P plot and scatter plot of residuals and predicted values. Therefore, in our case, according to Figure 5 and 6 both assumptions are failed. Because, the points are not lied on the diagonal line; therefore, normal P-P plot for normality test indicated the deviation from normality. Similarly, the scatter plot shows some regular pattern indicating the heteroscedasticity. Thus, both assumptions are not met.

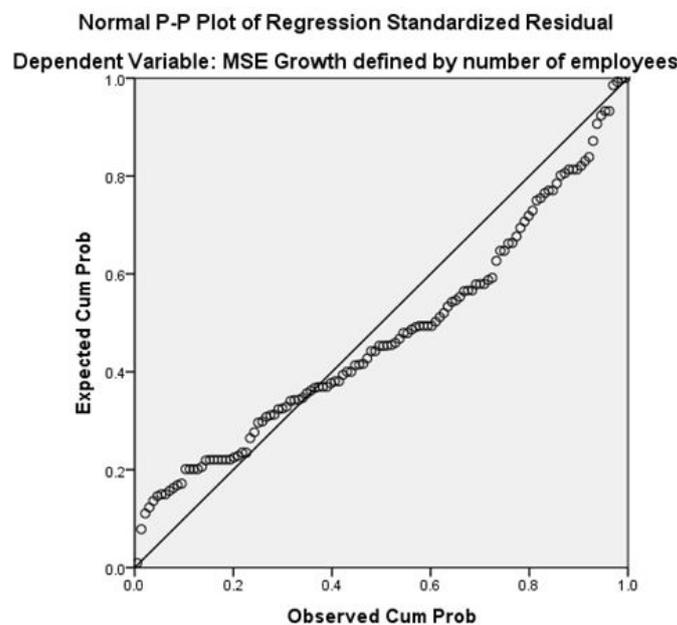


Figure 5: Normality Test Using Normal P-P Plot for Multiple Linear Regression

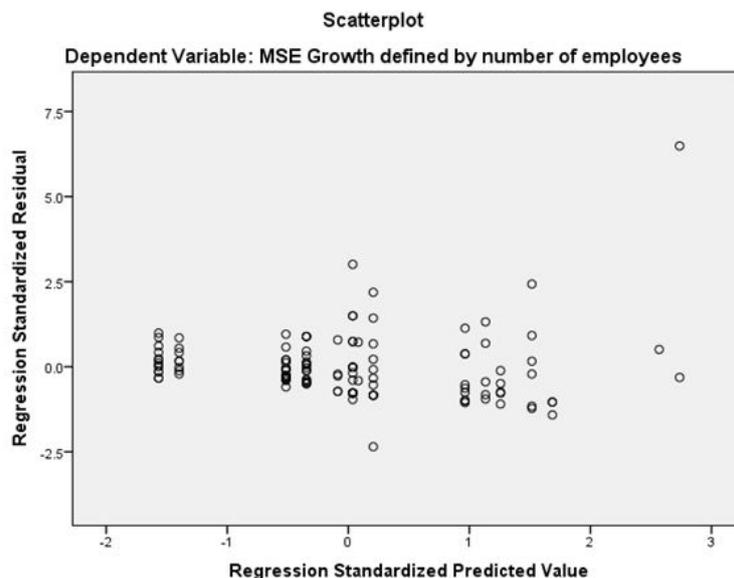


Figure 6: Scatter Plot for Homoscedasticity Test

Furthermore, the numerical test for normality can be detected by using Kolmogorov-Smirnov and Shapiro-Wilk tests. In this study, we adopted these to statistic for normality test. According to results for normality test for MSEs versus four predictors are displayed in Table 7. All the results are statistically significant (P -value < 0.001) by rejecting the null hypotheses that say normality assumption is achieved

In general, we can summarize that both graphical and numerical results indicated the failure of normality assumptions. What shall we do? The remedy for these problems is transforming the dependent variable by using either natural logarithm or square root transformation. However, in our case the dependent variable has negative values or entries. In this case, we can use neither of the two mentioned transformation approaches. The best way to solve this problem is then thinking generalized linear models with fewer assumptions. Thus, in our case, we adopted the binary logistic regression by dichotomizing the dependent variable as it was clearly shown in Section 8.

Research Question: Does the dichotomous response variables MSEs growth in terms of employment size has any relationship with entire independent variables included in model?

Null Hypothesis: H_0 : The Dichotomous Response variable is statistically not related with entire predictors.

Or

$$H_0 : \beta_i = 0 \left(\text{odds ratio} \frac{\pi(x)}{1-\pi(x)} = 1 = e^{\beta_i} \right)$$

Alternative Hypothesis: H_A : The Dichotomous Response variable is statistically related with entire predictors.

Or

$$H_0 : \beta_i \neq 0 \left(\text{odds ratio} \frac{\pi(x)}{1-\pi(x)} = e^{\beta_i} \neq 1 \right)$$

Binary Logistic Regression

According to the results displayed in Table 8, the dichotomous response advancement in MSEs is positively associated with all predictors except prevalence of lack of information ($\beta_4 = -0.529$ ($S.E. = 0.589$)) relative to the reference level i.e.; “no lack of information” indicating a statistically insignificant negative relationship with advancement in MSEs (P -value = 0.369). Furthermore, out of a total four categorical predictors two of them such as access to credit (P -value = 0.007, Z -value=17.668) and work promise (SHAD) (P -value = 0.008, Z -value = 4.947) have a statistically significant relationship with dichotomous response advancement in MSEs relative to their respective reference levels no access to credit and have no work promise.

Therefore, there is enough evidence to reject the null hypothesis in favor of the alternative hypothesis at 5% level of significance. Whereas, the rest two categorical predictors such as a location of an enterprise (P -value = 0.461, Z -value =1.7) and lack of information (P -value = 0.369, Z -value = 0.569) are statistically insignificant. It gives the sense that there is no evidence to reject the null hypothesis that says there is no relationship between advancement in MSEs and independent variables location of enterprise and lack of information having small Wald test statistics (Z -test) values associated with large p -values.

Additionally, the coefficient or parameter for access to credit 2.872(1.06) indicated that the estimated odds of advancement in MSEs are 2.872 times higher for the firms having access to credit than have not access to credit. Likewise, the parameter for working promise (1.599(0.605)) has shown that the estimated odds of advancement in MSEs are 1.599 times bigger for firms having the working promise relative to have not working promise keeping all the rest factors constant.

Moreover, the odds of success to advancement in MSEs are 17.668 (66.8%) times most likely successful for firms having access to credit relative to do not have access to credit. Furthermore, the odds ratio of working promise (4.947) has shown that the firms having work promise is 4.947(94.7%) times more likely to advance up in MSE than firms are without working promise. Based on the 95% confidence intervals of odds ratio for access to credit (2.215, 140.954) and working promise (1.510,16.285), it can be concluded that since both intervals do not include 1, it means that there is a statistically significant effect on the prevalence of advancement in MSEs that caused due to the having access to credit and working promise respectively.

Therefore, the null hypothesis that says there is no relationship between the prevalence of advancement in MSEs and access to credit and/or working promise is rejected in favor of the alternative hypothesis. Both intervals are greater than one indicating that the factors access to credit and working promise have a positive significant relationship with the probability of response variable (advancement in MSEs).

Generally, the Wald Z - test shows that the large Wald test statistic values associated to small P -values provide us more evidence of rejecting the null hypothesis that says all coefficients are equal to zero or all the odds of interested and baseline/reference levels are equal that means in short odds ratios are equal to one. In addition to this, the values in the bracket with coefficients are the standard errors indicating the precision of the estimation of the parameters and coefficients. The smaller standard errors (S.E) values refer better precisions and accuracy of estimations and higher standard errors (S.E) values in opposite senses. Here the insignificant results may not be interpreted because of no need to interpret statistically insignificant results. For further detail information, please take look in Table 7.

| Predictors | Coef. β_i | S.E. | Wald | Df | P-value | OR (e^{β}) | 95% C.I. for e^{β} | |
|-------------------------------------|-----------------|------|---------------|--------------------------|--------------------|----------------------|--------------------------|--------|
| | | | | | | | Lower | Upper |
| Constant | -0.03 | 0.58 | 0.00 | 1 | 0.96 | 0.97 | | |
| Access to Credit | 2.87 | 1.06 | 7.34 | 1 | <0.01 | 17.67 | 2.22 | 140.95 |
| Location of firm | 0.53 | 0.72 | 0.54 | 1 | 0.46 | 1.70 | 0.42 | 6.97 |
| Working Promise | 1.60 | 0.61 | 6.98 | 1 | <0.01 | 4.95 | 1.51 | 16.21 |
| Lack of information | -0.53 | 0.59 | 0.81 | 1 | 0.37 | 0.59 | 0.19 | 1.87 |
| Omnibus Tests of Model Coefficients | | | Model Summary | | | | | |
| | Chi-square | Df | Sig. | Step | -2 Log likelihoods | Cox & Snell R Square | Nagelkerke R Square | |
| Step | 29.61 | 4 | <0.01 | 1 | 82.44 | 0.22 | 0.36 | |
| Block | 29.61 | 4 | <0.01 | Hosmer and Lemeshow Test | | | | |
| Model | 29.61 | 4 | <0.01 | Step | Chi-square | df | P-value (Sig.) | |
| | | | | 1 | 2.62 | 7 | 0.92 | |

Sources: Own Survey data (2017).
 Table 7: Results for Binary Logistic regression of MSE growth

Model Good fitness test

Null Hypothesis: H_0 : The null model is a good fitting model

Alternative Hypothesis: H_A : The null model is not a good fitting model (i.e. The predictors have a significant effect)

Good fit test: According to the results displayed in Table 8 Omnibus Tests for Model Coefficients with Chi-square ($X^2_4 = 29.61$ (P - Value < 0.001)) for the prevalence of advancement in MSE, indicated that the overall model is statistical significance at 5% level of significance. In addition to that, the Hosmer-Lemeshow Goodness-of-Fit Test for both models with HL statistic ($X^2_7 = 2.623$ (P - Value = 0.918)) led us to do not reject the null hypothesis that says there is no difference between the observed and predicted values or the model is inadequate for the data; indicating that the logistic regression model is a good fit to the data. Furthermore, besides the omnibus test, based on the model summary we can conclude that between 21.6% and 35.9% of the variation in response variable prevalence advancement in MSEs can be explained by the model (Table 8).

| Tests of Normality | | | | | | | | |
|---|-------------|---------------------------------|-------|-------|--------------|-------|------|-------|
| Response | Predictors | Kolmogorov-Smirnov ^a | | | Shapiro-Wilk | | | |
| | | Statistic | df | Sig. | Statistic | df | Sig. | |
| MSE Growth defined by number of employees | .00 1.00 | | 0.196 | 67 | 0.000 | 0.841 | 67 | 0.000 |
| | | Access to credit | 0.244 | 55 | 0.000 | 0.542 | 55 | 0.000 |
| | | Lack of Information | 0.243 | 54 | 0.000 | 0.621 | 54 | 0.000 |
| | | | 0.214 | 68 | 0.000 | 0.809 | 68 | 0.000 |
| | | Working Premises (SHADE) | 0.209 | 47 | 0.000 | 0.747 | 47 | 0.000 |
| | | | 0.162 | 75 | 0.000 | 0.880 | 75 | 0.000 |
| | | Location of Enterprise | 0.190 | 89 | 0.000 | 0.854 | 89 | 0.000 |
| 0.226 | 33 | | 0.000 | 0.665 | 33 | 0.000 | | |

^a Lilliefors Significance Correction
 Sources: Own Survey data (2017).
 Table 8: Numerical Test for Normality Assumptions of MSEs against entire Predictors

Discussions

Based on different well-organized pieces of literature and analysis that were included in this article, some discussions and review of works are organized as follows.

The aim of this study was to model binary logistic regression on the success of micro and small manufacturing enterprises conditional to predetermined predictors in the North part of Ethiopia Adigrat city. To this end, questionnaires were developed and addressed to respondents to predict the probability of the success of MSEs conditional on the associated predetermined predictors; then in turn to suggest the solutions for the prioritized problems. The study was organized by descriptive survey study and 122 micro and small enterprise was included in the study. The data obtained were analyzed by using a descriptive method and relevant models to measure the growth of micro and small enterprises. According to several reviews of previous works and realities in the ground, the obvious and well-known measuring indicators of advancement are, profit or revenue, employment size, supply, quality of product and total assets.

Nevertheless, in this study, the advancement in MSEs is measured by the employment size of the enterprises. This study in line with Abay, *et al.*, in their recent work has taken employment size as the main measure of advancement in MSEs [10]. Therefore, after deciding the main indicator of the advancement in MSEs as the existence of advancement in terms of employment size, the relevant statistical model binary logistic regression has been applied to measure the significant relationship between responses and predetermined predictors. The prevalence of the advancement in MSEs was set in terms of employment size, whether it has been increasing or not based on the respective experiences or lifetime of the firm.

According to the result of binary logistic regression model, for advancement in MSE versus four predictors such as access to credit (ACC), working premises (SHAD), location of enterprise (LOE) and lack of information (LIF), the latter two predictors with p-values 0.461 and 0.369 have shown insignificant relationship with advancement in MSEs. Whereas the former two predictors ACC (P-value =0.007) and SHAD (P-value =0.008) are found to be statistically significant. These findings are consistent with the findings of Abay, *et al.*, entitled “external factors affecting the advancement of micro and small enterprises (MSEs) in Ethiopia”; using the same model with three predictors such as access to credit, working premises and infrastructure except in this paper the predictor infrastructure was excluded and replaced by LOE and LIF [10].

However, Abay, *et al.*, stated that, the access to credit has negatively affected the MSEs growth as odds ratio has shown that the probability of advancement for those MSEs that had access to credit from formal financial sources was 0.24 times lower than those MSEs that have no access to credit from formal financial sources. Contradicting to Abay, *et al.*, our finding has shown that, access to credit has a positive effect on advancement in MSEs; the probability of success to advancement in MSEs is 17.668 (66.8%) times most likely successful for firms having access to credit relative to do not have access to credit. Unlike Abay, *et al.*, this finding is consistent to the result of Siyoum and Eshetu & Zeleke which stated that access to credit from formal financial sources has a significant positive effect on advancement in MSEs [10,19,29].

Generally, the overall model for the Omnibus test of Chi-square for binary logistic regression (p-value<0.001) is found to be statistically significant and the results of the model in lines to the results of binary logistic regression in Abay, *et al* [10].

Finally, this paper was concerned only on one indicator of advancement in MSEs out of several indicators. Therefore, this work can open the direction for future work that can measure the advancement in MSEs by extending to several alternative advancement indicators.

Conclusion and Recommendations

Conclusion

The main aim of the study is to model the probability of successful advancement in MSE on micro and small enterprises (MSEs) under the manufacturing sector in northern Ethiopia, particularly in Adigrat Town. Hence, after passing through reviewing related works and applying relevant analyzing techniques to show the relationship between advancement in MSEs and associated predictors, we came up with summarized results and discussions.

According to the findings, the female contribution in manufacturing is relatively low. The results can lead us to generalize that, women operators are not beneficiary from manufacturing. Therefore, the sector needs to provide better attention to female enterprises in order to increase the outdoor employment opportunities they lack so far in the manufacturing sector.

In addition to this, the result of binary logistic model, we can conclude that, out of the four predictors included in the model, the two predictors, access to credit and working premises have statistically positive significant effect on the probability of successful advancement in MSEs relative to the firms without access to credit and working premises respectively. Likewise, the summary of the binary logistic regression has shown that the overall model is found to be statistically significant and a good fit with Chi-square $P - value \leq 0.001$ of Omnibus test for coefficients and Hosmer and Lemeshow Test $P - value \leq 0.918$ respectively.

Generally, the findings have shown that, although a few numbers of enterprises have shown improvement in advancement in MSEs, the majority of the enterprises are still stable as stagnant and some of them have shown the decline pattern. The main reasons mentioned by the respondents are lack of access to credit and lack of working place fit to the growth level of their business and lack of technical skills as the major causes.

Recommendation

According to the major findings of the study, the MSE sector faces a lot of challenges. Even though finance is an engine for both new entrants to the sector and existing MSEs operators, it is still the major problem of MSEs in the study area. The problem occurs in different ways like lack of collateral, inadequate amount of money, high-interest rate, and bureaucratic structure. Therefore, the government should reply to the policy of bank and financial institutions regarding collateral and minimizing interest rates. Moreover, Financial institutions and concerned officials should increase the amount of money they lend to MSEs operators, especially for manufacturing entrepreneurs. Thus, avoiding bureaucratic structure and making reform could be an important solution.

MSEs Operators lack access for land to produce and sales their goods and services. The study has indicated that serving business with industrial land or working space is one feasible area of intervention to sustain the growth of enterprises. In the case area, the land is on the hand of local government. Therefore, the government has to provide sufficient space to MSEs for the production and sales of their goods and services. In addition, government and concerned officials should make a research of the market place and facilitate infrastructure before providing the place and should limit the number of traders in specific places rather than wing all the roadsides. Concerning policies, rules, and regulations of MSEs the government should create awareness and publicize the policies that it draws to make them aware of their rights and duties.

Most of all, experience shows that people best help themselves. Rather than spoon feeding them with outside intervention, they should be encouraged and enabled to organize themselves to demand the services and policies they need through active participation. Furthermore, the government and city administration should sponsor and encourage researchers to study the needs and constraints of MSEs in view of identifying the critical areas of assistance.

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