



# Modeling Performance of Micro and Small Manufacturing Enterprises Conditional to Entire Constraints in Northern Ethiopia, Case Study in Adigrat City Tigray, Ethiopia

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## Abstract

**Background:** Certainly, the thoughtful tricky in urban areas of emerging countries like Ethiopia is scarcity and deficiency which could be expressed in terms of joblessness and low revenue. Hence, Adigrat is one of the city in northern Ethiopia suffering from same problem. The overwhelming solution that could be taken is enhancing micro and small industries of the which in turn are essential catalyst and tools for growth, job creation and social progress to generate more equitable income distribution.

**Objective:** The aim of this study was to model performance of micro and small-scale manufacturing industries conditional to entire constraints in Adigrat city.

**Methods and tools:** The research has been designed in cross-sectional format using stratified sampling techniques in six different manufacturing enterprises (strata). Total of 127 respondents, 122 out of target population 648 including has been taken using systematic sampling techniques. After collecting primary data through well-administered questionnaires multiple linear regressions was modeled.

**Results and findings:** Out of six categorical and one continues predictors included in multiple linear regression model, except lack of raw materials and lack of demand, all the rest predictors have significant influence on monthly revenue which in turn affect the growth performance of MSEs. The overall regression model is statistically significant ( $P\text{-value} \leq 0.001$ ) and 72.3% of the variability is explained by model.

**Conclusions:** Generally, it can be concluded that, experience of the enterprises, lack of initial capital, lack of market linkage, lack of access to latest technology, and power interruption are the major constraintson performance of manufacturing enterprise in Adigrat city.

**Keywords:** Capital, Growth Performance, MSE, Multiple linear regressions, Revenue

## INTRODUCTION

In many developing countries, micro and small-scale manufacturing 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.

In fact, the thoughtful tricky in urban areas of emerging countries like Ethiopia is scarcity which could be expressed in terms of joblessness and low revenue. Hence, Adigrat is one of the city in northern Ethiopia suffering from same problem. The irresistible solution that could be taken is enhancing micro and small enterprises of the city due to the reasons that MSEs and the small business sector are essential catalyst and

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tools for growth, job creation and social progress to generate more equitable income distribution. Thus, micro and small enterprises are expected to play a significant role in the national economic development, particularly, in the creation of employment opportunities and poverty reduction. However, in Ethiopia their contribution is very low when compared to other developing countries. This may be due to different reasons; for instance, in developing countries, lack of capital is seen as the real factor that is limiting the expansion of businesses at least at the micro-enterprise level of operation (Abay et al., 2014). Keeping this in mind, the federal government of Ethiopia had articulated its first micro and small enterprise development strategy in 1997.

As an experience, 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 (Biretawi, 2013).

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 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%) in (Biretawi, 2013).

Asgedom(2013) noted that the enterprises face difficulties in getting loans from the financial institutions due to high collateral requirements and the plant has suffered from inadequacy of machineries and lack of modern technology. MSEs are constrained by shortage of skilled labor force, lack of business premises, poor product quality, and shortage of raw material, lack of business information and training and burden of some bureaucratic and high taxation.

Several questions raise in the mind of authors in context of the constraints that mainly influence the performance of micro and small-scale manufacturing industries in emerging countries. One may ask himself that, what are the key challenges affecting the growth of micro and small manufacturing enterprises in Adigrat city? How do the government and other stakeholders contribute in MSEs to play their role in poverty alleviation? Therefore, these kinds of questions are expected to be answered at the end of the study.

The development of small and micro enterprises is hindered by various problems among the problems lack of capital for commence, 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 capital shortage (Walmobo, 1996)

Moreover, finance is an engine for both new entry to the sector and existing MSEs operators. There are several studies that focused on the financial aspect of MSEs through his study in MSEs' profitability, showed that the profitability of micro and small enterprises mainly depends on the initial capital, the low the initial capital results low productivity and in turn to low earning per employ and vice versa. Moreover, Walmobo (1996) 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. 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 (Abay et al., 2014).

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In developing countries, MSEs operators do not seem to try out market niches for improves or slightly diversified products. Moreover, since they mostly copy what neighbors and friends produced, market and profit margins are limited (Walomm, 1996) micro and small enterprises entrepreneur faces problems in the matter of marketing his product. Due to want to adequate co-operative or other marketing facilities and intelligence often suffers from remunerative price of their goods in the open market (Burn, 2001). In free market economy, especially with stiff competition marketing is a key factor for the success of small business (Gebretinsae, 2003)

Furthermore, new technologies improve efficiency, enable greater production, and are a source of profit for SMEs. Technological capabilities benefit SMEs in several ways. They enhance SME efficiency, reduce costs, and broaden market share, both locally and globally. Some scholars argue that a small business that adopts greater levels of technological sophistication can be expected to grow more rapidly than a similar firm that does not (Asgedom, 2013).

The remained part of this paper is organized as follows. Section 2 introduces the methods and framework which are going to be used in the whole paper. Section 3 talks about the results of multiple linear regressions and general discussion of the article. Finally, Section 4 presents conclusions and recommendations of the study.

### **METHODOLOGY OF THE STUDY**

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

#### **Research Design**

Cooper and Schindler (2008) refer to research design as the plan and structure of investigation so conceived as to obtain answers to the research questions. Moreover, Kothari (2004) 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. In summary, a research design is a master plan that specifies the methods and procedures for collecting and analyzing the needed information.

Accordingly, the cross-sectional research design has been conducted using stratified sampling techniques in six different manufacturing enterprises (strata). Therefore, out of the total number of 648 target population, 122 respondents have been taken using systematic sampling techniques. Both qualitative and quantitative data were included using primary data source in order to modelthe predetermined predictors on performance of MSEs. The well-administered questionnaires were distributed to the respondents in systematic way to minimize the subjective biases. Finally, the relevant and most widely used statistical models so known as multiple linear regressions for continues response was applied to assess the relationship between the response variable monthly revenue, which is the main indicatorof MSE and associated constraints so-called predictors.

#### **Sample Size determination**

Taking sample size have a great advantage over census in different studies to eliminate the wastage of time as well as cost and resources; therefore, the investigators always take a sub-part of populations which must represents the information of populations as whole. In order to have adequate information to achieve the reasonable results and conclusions it must to have enough sample size which represents the information of

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populations as whole. According to the sample size formula published by Dillman (2007), the sample size will be determined (quoted by Fissuh, et al., 2016).

$$n = \frac{N \cdot P(1-P)}{(N-1) \cdot (d/Z_{(\alpha/2)})^2 + P(1-P)} \quad (1)$$

where  $n$  is total sample, size needed for desired level of precision  $N$  is total size of population  $P$  is chance that any respondent will answer a question the same as any other respondent  $d$  is acceptable amount of sampling error (margin error)  $Z_{(\alpha/2)}$  is statistic associated with the confidence level.

To have maximum sample size, and level of significance was taken and therefore,  $Z_{(\alpha/2)}$  will be equal to 1.96 according to standard normal table. The desired total sample size  $n$  will be proportionally allocated in to strata sample sizes. In

Accordingly, to allocate sample size for each stratum the general formula will be used as follows.

$$n_h = \frac{nN_h}{N} \quad (2)$$

Notations:  $n$ =the overall sample size:

$n_h$ = The sample size in each stratum,

$N_h$ = The total number of populations in the  $h^{\text{th}}$  stratum and  $N$  is total size of study population.

### Methods of Data Collection

In any research, different sources of data are implemented to respond 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.

One important of statistical survey is questionnaire method. The simplest definition of questionnaire is that of a group or sequence of question. Thus, for this study,well-administered questionnaire wasdistributed to 122 respondents to collect relevant information from the sample taken from target population. Furthermore, the review of relevant documents or files, annual abstract and literatures was conducted to have adequate information about main constraints influencing on the performance of MSEs growth. In order to elicit information upon subject from respondents, similar questionnaire for all respondents was prepared.both open and close-ended questionnaire have been included.

### Methods of Data Analysis

On the analysis stage, both quantitative and qualitative data were analyzed. Some relevant statistical analysis was implemented based on the characteristics of data. In this study to observe and overview, the general features of the data on each variable some descriptive as well as inferential statistics are employed. 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(Fissuh, et al., 2016). 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 statistical method deals with making inference or conclusion about population based on data obtained from a limited number of observations that come from the population. Inferential statistics consists of estimation and hypothesis testing (Fissuh, et al., 2016). Then with techniques of statistical analysis multiple linear regression was conducted in the research paper. Inferential statistics consists of estimation and hypothesis testing. Therefore, to model the performance of micro and small enterprises which is measure by continues response (Monthly Revenue of MSE)conditional to predetermined constraints multiple linear regression was proposed.

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**Multivariate Linear Regression Models**

Multiple linear regressions are the most common form of linear regression analysis. 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 (Agresti, 1990, quoted by Fissuh, et al. ,2016). Hence, in this paper, the response variable monthly revenue of firm versus some predefined predictors or challenging factors including one continues predictor experience (life time) of the firm and 6 categorical factors/predictors such as, technology, power interruption, access to row materials, initial capital, lack of demand and Market linkage. Therefore, the variables are defined in the table below.

**Table3.1. Variable descriptions and creating dummy variables for multiples linear regression**

Continues variables			
Name of Variables		Measurement Scale	
Monthly Revenue of the Firm		Ratio Scale/continues	
Experience (Life time of Firm)		Ratio scale/continues	
Categorical Predictors			
Name of Variables	Measurement Scale	Category levels	(K-1) Dummy/Indicator Variables K indicates number of categories
Technology used in the given firm	Ordinal	1=Latest, 2=Outdated, 3=Manual (Reference level)	
Sequence of Power Interruption	Ordinal	1=Frequently, 2=Rarely, 3=Not at all (Reference level)	
Raw Materials	Nominal	0= No, 1=Yes	
Initial Capital of given firm	Ordinal	>50,000=1, 20,001-50,000=2, <20,000=3	
Demand	Nominal	0= No, 1= Yes	
Market Linkage	Ordinal	1=High, 2= Fair, 3= Low	

Based on the defined variable in table 3.1, the following multiple linear regression model is formulated for to predict the relationship between monthly revenue, which is the one of the indicator of MSE growth and predictor/independent variables (Challenging factors)

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \epsilon_i \quad (3)$$

Where, dependent variable (Monthly Revenue), are the estimated coefficients or parameters, are fixed known predictors or independent variables and random errors.

k=1,2,...,11 & i=1,2,..., n=122

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

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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 (Agresti, 1990; quoted by Fissuh, et al.,2016

### RESULTS AND DISCUSSION

#### Results

##### *Data descriptions and General Characteristics*

This study generally deals with modeling the performance of micro and small enterprises which is mainly rated by monthly revenue of the micro and small-scale manufacturing enterprise holders in Adigrat city, Tigray, Ethiopia. The study is done based on a number of literature dealing with MSEs' major constraints. Cross sectional, study design was applied with careful investigation about main constraints influencing performance of MSEs. Particularly, the study is conducted in manufacturing enterprises in Adigrat city. Generally, after the careful and intentional collection of data, the investigator has come up with well-organized methodological and empirical results.

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.

**Table 4.1** *Percentage of MSE owners who got support from NGOs and stalk holders*

Type of Support		Frequency	Percent	Valid %	Cumulative %
Valid	Training	17	13.9	13.9	13.9
	Financial	11	9	9	23
	Information	11	9	9	32
	Others	3	2.5	2.5	34.4
	No support	80	65.6	65.6	100
	Total	122	100	100	

Sources: Own Survey data (2017)

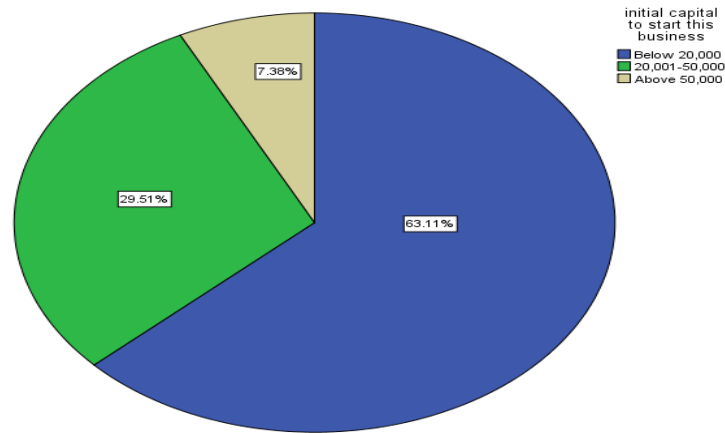
Table 4.1 signified the proportion of support for MSE owners from NGOs and stakeholders. The majority (65.6%) of the respondents said they did not get any support. Approximately 14% of them said they got training support whereas the small and equal proportion that is 9% of MSE owners were given financial and information support.

Thus, the result in turn elaborates the gap of the government and other concerned sectors in supporting the motivated new business starters in capital, in job creativity, in technical skill improvement trainings and motivations or incentives. Hence, based on this fact, it is possible to conclude that there has been very serious problem to setup a new business in Adigrat City. This is due to inadequate support from the government, and NGOs and stalk holders.

Therefore, it is recommended that the government and other concerned sectors should take careful look and attention to solve these serious challenges of several motive individuals at starting enterprises.

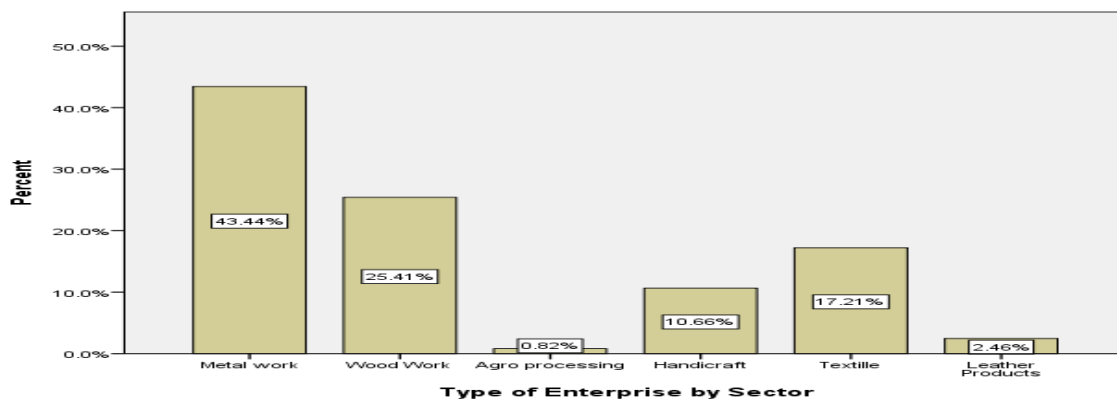


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**Fig4.1** initial capital of the enterprise (Sources: Own Survey data, 2017)

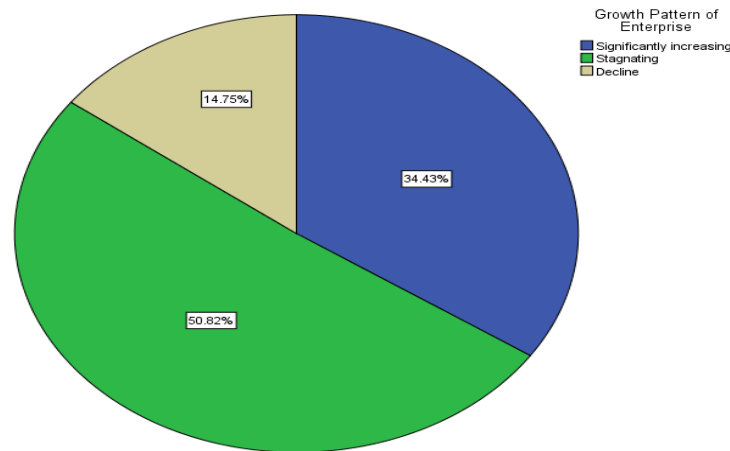
According to figure 4.1, the pie chart clearly illustrates that the percentage of the initial capital of the individual enterprises. Therefore, the chart shows that more than half (63.11%) of the respondents started their business with low capital which is below 20,000 ETB. However, the rest less than half individual enterprise beginners, started with the capital of between 20,001 and 50,000ETB; that is about 29.51% of total respondents and very few of them about 7.38% of the respondents were started their business with initial capital above 50,000 ETB. Therefore, it is true to say that, most of micro and small enterprise beginners in Adigrat City were started their business with very low capital. This fact in turn implies that in recent economy of the country, it is not easy to start the manufacturing business with the mentioned insignificant amount of capital.



**Fig4.2** types of Enterprise by sector (Sources: Own Survey data, 2017)

In fact, the Ethiopian government is giving special attention to the growth-oriented sectors specially manufacturing. Based on this fact the survey result figure 4.3 shows that the majority of the enterprises accounted 43.44% in Adigrat city has been participating in metalwork, 25.41% in woodwork 17.21% in textile and 10.66% in Handicraft. It is relatively better performance, whereas the figure indicated that leather production and agro-processing industries has taken small number of contribution accounting 2.46% and 0.82% respectively in manufacturing participation in the city. This clearly implies that there is a problem on surplus product in rural area and gap between urban and rural area linkage. Consequently, the government must focus in these aspects to overwhelm the serious challenges.

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**Fig4.4** Growth pattern of Enterprises (Sources: Own Survey data, 2017)

Figure 4.4 and table 4.2 shows the level of micro and small enterprise growth in Adigrat city. As it is depicted in the pie chart the majority around half of the micro and small enterprise in Adigrat city shows slow rate of growth level or stagnant which, accounted 50.8%, which is also followed by decline level accounted for 14.7 % of the total. The remaining 34.4 % of the respondents replied that their business level show fast growth. Thus, the result of survey study in table 4.2 indicates that, 102(83.6%) of the operators were micro level and 20(16.4%) of the operators were small level at the time of establishment. However, according to summary result in table 4.2, the current status shows that among 20 small enterprises 5 of them turn down to micro level and some of the operators were grown up from micro to small enterprises yet the number is not significant change as more than half 61.5% of the enterprise are still in micro level.

This shows that most of the micro and small enterprise in Adigrat city are not growing at an expected rate. The respondents are also asked the main reason for show decline and stagnant growth level of their business and they mentioned major problem like lack of access to credit, less amount of startup capital, lack of working place fit to the growth level of their business and lack of technical skill as the major causes.

**Table4.2** of enterprises at the time of establishment and current status

			Current Status		
			Micro	Small	Total
Status at Time of Establishment	Small	Count	5	15	20
		Table N %	4.1%	12.3%	16.4%
	Micro	Count	70	32	102
		Table N %	57.4%	26.2%	83.6%
	Total	Count	75	47	122
		Table N %	61.5%	38.5%	100.0%

Sources: Own Survey data (2017)

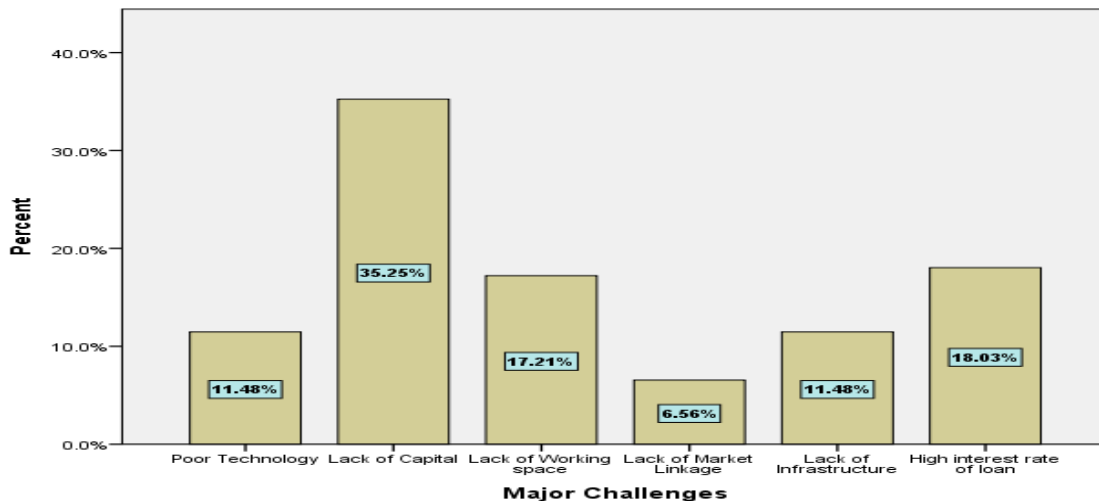
With the introduction of the new economic policy in Ethiopia, which is designed along the line of a market economy and the implementation of the reform programs, a more conducive business environment is being created. Even though, there is a general positive environment for the development of MSE, since the strategies



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and support programs are not fully or adequately implemented, there are still problems that constrain the growth of the MSE sector.

The major problems encountered by the Adigrat MSE operators in the process of running and expanding their activities is presented in figure 4.5.



**Fig4.5** the major problems of micro & small enterprises (Sources: Own Survey data, 2017)

The major Source for any business is finance. The availability of financial resources thus highly determines the productivity and development of any economic activity. According to the survey findings illustrated in figure 4.5, lack of working capital was among the most pressing problems that small enterprises identified as limiting expansion of their business.

The figure shows 35.25% of the interviewed small business operators in Adigrat city responded that lack of capital has been the first problem to their operation. Likewise, 18.03 % of MSEs have been suffering from high interest rate.

Beside to the fact that, the operators' opinion and actual observation, the cluster shade provided by the government have been stayed very limited for manufacturing small and micro enterprises. The chart also shows that about 17.21 % of the entrepreneurs reported that lack of working premises/ places was the third major problem.

The other problem, which is identified by the operator, was the poor supply of infrastructure facilities. According to the figure 4.5, the infrastructure problem was list among the stated problems contributing about 11.48 % out of the total challenges according to survey result reported by the respondents referring that the infrastructure facility problem was one of serious problems of the business enterprises. In most cases, the small and micro enterprises establishments are not well furnishing with the basic infrastructure facilities. In line to this, the accessibility of latest technology also was mentioned as the one of the problem faced by the operators indicating 11.48% of the MSEs in Adigrat city have been using poor technology, this implies that the profit of the operators is influenced to grow up. Indeed, without technology there is no development so it is impossible to grown up easily.

Furthermore, the limited market for any sort of goods and services has an automatic effect on the profitability of these business activities. The figure shows that 6.56% of the business operators responded that lack of market is the problem of their business activities

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**Model Results**

*Multiple Linear Regressions*

**Table4.3** Multiple Linear Regression model for Revenue of Enterprises versus Independent Factors

Predictors		Coefficient ( $\beta_i$ )	SE ( $\beta_i$ )	T	P-value	95% CI	
						Lower	Upper
Constant- $\beta_0$		7660.810	2139.411	3.581	0.001	3421.001	11900.620
Exp. of MSE- $\beta_1$		291.850	91.236	3.199	0.002	111.041	472.658
Tec.	Latest- $\beta_2$	4115.336	1760.305	2.338	0.021	626.824	7603.848
	Outdated- $\beta_3$	990.263	956.146	1.036	0.303	-904.594	2885.120
POI	Frequent- $\beta_4$	-6880.063	1774.629	-3.877	0.000	-10396.96	-3363.165
	Rarely- $\beta_5$	-6557.674	1624.894	-4.036	0.000	-9777.834	-3337.515
RAM	Yes- $\beta_6$	928.722	918.358	1.011	0.314	-891.248	2748.693
INC	>50,000- $\beta_7$	8664.013	1659.435	5.221	0.000	5375.401	11952.624
	20,001-50- $\beta_8$	908.473	911.813	0.996	0.321	-898.527	2715.474
Demand	Yes- $\beta_9$	-872.157	828.027	-1.053	0.295	-2513.112	768.798
Market Linkage	High- $\beta_{10}$	2910.833	1270.485	2.291	0.024	393.030	5428.637
	Fair- $\beta_{11}$	123.772	777.241	0.159	0.874	-1416.537	1664.080

**Model Summary**

	Correlation Coefficient(r)	Coefficient of Determination ( $R^2$ )	Adjusted ( $R^2$ )	Standard Error of the Estimates
	0.851	0.723	0.696	3759.50534

**ANOVA (Analysis of Variance) For overall Test**

Model	Sum Squares (SS)	DF	Mean Square(MS)	F	P-Value(Sig.)
Regression	4066582092.1	11	369689281.102	26.156	0.000
Residual	1554726842.3	110	14133880.385		
Total	5621308934.4	121			

Note: the t-test of significant relationship between response variable monthly revenue of MSE and individual parameter/coefficient of the predictors or challenging factors.

**Null hypothesis:** Monthly Revenue of MSE has no significant relationship with each predictor.

$$H_0: \beta_i=0, \text{ for } i=0,1,\dots,k, \quad k=11$$

**Alternative hypothesis:** Monthly Revenue of MSE has significant relationship with individual predictors

$$H_A: \beta_i \neq 0, \text{ for } i=1,\dots,k, \quad k=11$$

$$\hat{Y}_i = 7660.810 + 291.85X_1 + 4115.336X_2 + 990.263X_3 - 6880.063X_4 - 6557.674X_5 + 928.722X_6 + 8664.013X_7 + 908.473X_8 - 872.157X_9 + 2910.833X_{10} + 123.772X_{11}$$

The result for multiple linear regressions to monthly revenue of MSE versus some predictors (challenging factors) is displayed in table 4.6. One continues and six categorical predictors with respective dummy variables

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were included in the model. Consequently, out of total 11 predictors, five of them, such as outdated technology users (P-value=0.303), access of raw materials (P-value=0.314), INC (20,001-50,000) holders (P-value=0.321), lack of demand (P-value=0.295) and fair market linkage owners (P-value=0.874) were found that, statistically insignificant. This sense indicates lack of evidence to reject the null hypothesis that says there is no relationship between Monthly Revenue of MSE and the mentioned factors at 5% level of significance. Whereas, the rest six predictors, such as experience (lifetime) of enterprise or firm (P-value = 0.002), latest technology user (P-value=0.021), both frequently and rarely power interruption problem owners (P-value <0.001), above 50,000 initial capital holders (P-value <0.001) and high market linkage owners (P-value = 0.024) have statistically significant relationship with monthly revenue of MSE. Therefore, there is enough evidence to reject the null hypothesis stated above at 5% level of significance.

Moreover, except the predictor variables power interruption ( $\beta_4 = -6880.063$  (S.E.=1774.629),  $\beta_5 = -6557.674$  (S.E.=1624.894) indicated statistically significant negative relationship with monthly revenue of MSE, and lack of demand ( $\beta_6 = -872.157$  (S.E. = 828.027) indicated statistically insignificant negative relationship with monthly revenue of MSE, all the rest variables are positively related with response variable monthly revenue of MSE. Therefore, the negative coefficient or parameter for power interruption indicated that, the monthly revenue of MSE is times lower in the firms that face frequent power interruption than that of firms without any power interruption when all the rest-challenging factors kept constant. Likewise, the firms with rare power interruption has times low amount of monthly revenue of MSE relative to the firms without any power interruption holding all the rest challenges unchanged. Consequently, the result has shown that power interruption has statistically significant influence on the monthly revenue of MSE (p-value<0.001) for both levels relative to the reference level no power interruption.

Moreover, the coefficient for experience of MSE ( (S.E. = 91.236)) indicated that, the amount of monthly revenue of MSE increases by rate of per a unit increase in experience of MSE if all the other variables kept constant. Similarly, the parameter for latest technology users ( (S.E. = 1760.305)) refers, the amount of monthly revenue of MSE is 4115.336 times higher in technology users than that of comparison groups manually involved assuming all the rest variables hold constant. Likewise, the monthly revenue of above 50,000 initial capital holders (8664.013 (S.E. = 1659.435)) is 8664.013 times higher than that of the firms below 20,000 holders if all the rest variables hold constant. Finally, the parameter for high market linkage owners ( indicated that, the amount of monthly revenue of MSE for high market linkage owners is 2910.833 times higher than that of low market linkage owners if all the rest kept constant.

Generally, the variable with the large test statistic value, which is t-values accompanied with small p-values, indicates the statistically significant relationship between response variable monthly revenue and respective predictors. Likewise, 95% confidence intervals displayed at the right-side column of table 4.6, could provide similar conclusions.

For instance, the 95% confidence intervals for statistically significant parameters of predictors such as experience of MSE, latest technology users, firms faced frequent power interruption, firms faced rare power interruption, above 50,000 initial capital holder and high market linkage owners are (3421.001, 11900.2620), (111.041, 472.658), (-10396.96, -3363.165), (-9777.834, -3337.515), (5375.401, 11952.624) and (393.030, 5428.637) respectively. Hence, all the mentioned intervals excluded zero inside the intervals indicating the rejection of null hypothesis stated in the above in favor of the alternative one. However, the 95% confidence intervals of parameters for the rest statistically insignificant predictors have included zero in the intervals indicating that there is no evidence to reject the null hypothesis. For further details, look at table 4.6.

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### Note: The Overall F-test and Good fit test of the multiple linear regression models

**Null hypothesis:** Monthly Revenue of MSE has no significant relationship with all predictors.

$$H_0: \beta_0 = \beta_1 = \beta_2 = \dots = \beta_k = 0, \quad \text{for } i=0,1,\dots,k, \quad k=11$$

**Alternative hypothesis:** Monthly Revenue of MSE has significant relationship at least with one predictor.

$$H_A: \beta_i \neq 0, \quad \text{at least for one } i, \quad i=0,1,\dots,k, k=11$$

Moreover, the result of ANOVA for multiple regression displayed in table 4.6, indicated that the overall multiple regression model is statistical significant with (F =26.156, p-value<0.001).

Furthermore, correlation coefficient, which is the measure of strength of relationship and determination of coefficient, which is measure of variability, explained by the model or by the predictors/independent variables are displayed in table 4.6. Accordingly, correlation coefficient () indicated that there is strong positive relationship between response variable monthly revenue and predictors (challenging factors) included in the model.

Similarly, the determination of coefficient () shows, the 72.3% of the variability is explained or caused by the data in model. In short, 72.3% of the response/dependent variable monthly revenue of MSE is explained by the given predictors/independent variables included in the model. This also measures the goodness of fit of the model. Therefore, it indicated that the regression model is moderately good fit.

Gradually, the values appeared in the bracket with coefficients everywhere in this paper are standard errors and are measures of precision, accuracy and consistency of the estimated results for prediction. The small values of standard errors tell us the estimations are good for prediction and large standard errors tell us the reverse. Furthermore, the standard errors are very important to calculate confidence intervals and estimate coefficients in the model.

Finally, multiple linear regression models for response variables which is the monthly revenue of MSE has shown that there is statistically significant association among the dependent variables monthly revenue of MSE and some challenging factors.<sup>1</sup>

## DISCUSSIONS

Based on different well-organized literatures and analysis that were included in this thesis, some discussions and review of works are organized as following.

The aim of this study was to model the performance of micro and small manufacturing enterprises which was mainly represented by monthly revenue conditional to predetermined constraints so-called predictors in North part of Ethiopia Adigrat city. To do so, questionnaires were drafted and distributed to respondents to find out the main constraints associated to the performance of MSEs then in turn to suggest the solutions for thoughtful problems. The study was organized by descriptive survey study and 122 micro and small enterprise individual holders were included in the study. The data obtained were analyzed by using descriptive method and relevant models to measure the performance 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 growth are, profit or

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1 **Note:** The P-Values of less than 5% indicate that the significant relationship of the dependent and independent variables. Similarly, if the 95% Confidence interval for odds ratios exclude one inside the interval, it shows significant relationships unless shows statistically insignificant results.

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revenue, employment size, supply, quality of product and total assets. However, in our case the monthly revenue was taken as the indicator response of performance of MSEs.

In contrast to this, Abay et al. (2014) in their recent work have taken employment size as the main measure of MSEs growth. However, it is obviously true to say that, measuring the MSE growth with monthly revenue may have reasonable advantage. Therefore, after deciding the main indicators of the MSEs' growth as one continuous variable, which is monthly revenue the relevant statistical model multiple linear regression has been applied to measure the significant relationship between response and predetermined constraints. The prevalence of the performance in MSEs was set in terms of Monthly revenue, whether it has been performing or not based on the respective experiences or life time of the firm.

Generally, the overall models for both models such as ANOVA for multiple regression ( $p\text{-value} < 0.001$ ) is found to be statistically significant and the results of latter model in lines to the results of binary logistic regression in Abay et al. (2014).

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

### **CONCLUSION AND RECOMMENDATIONS**

#### **Conclusion**

The main aim of the study is to model the performance of MSEs conditional to the predetermined constraints or predictors. Hence, after passing through relevant analyzing techniques to show the relationship between MSEs performance and associated constraints or predictors, we came up with summarized results and discussions.

The result has shown that, the majority (65.6%) of the respondents have been working without any NGOs support. and (63.11%) of the respondents started their business with low capital which is below 20,000 ETB. in Addition to this when we see the source of initial capital of the enterprises covering 92.62% of the total enterprises were from personal saving, relative support and loan from the relatives; Likewise, even though there is somehow a support especially in training from government, yet the result magnifies the gap of the government and other concerned sectors in supporting the motivated new business starters in capital, in job creativity, in technical skill improvement and motivations or incentives. Hence, this fact leads to conclude that there has been very serious problem to setup a new manufacturing business in Adigrat City.

Based on the fact the result shows that the majority of the enterprises accounted 68.85% in Adigrat city has been participating in metalwork and woodwork. Whereas the survey indicated that leather production and agro-processing industries has taken mingles number, this clearly implies that there is a problem on surplus product in rural area and gap between urban and rural area market linkage. From this fact, it can be possible to conclude that the government bodies are not concerned to motivate micro and small enterprises to join the sectors. Consequently, according to the national strategy, the government must focus in these aspects to overwhelm the serious challenges.

Beside the mentioned conclusions above, the results of the models elaborated similar conclusions. According to the multiple linear regression model, out of six categorical and one continues predictors, except two such as lack of raw materials and lack of demand, all the rest predictors have significant influence on monthly revenue which in turn affect the growth performance of MSEs. Furthermore, the model shows that power interruption

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has negatively significant influence on growth of MSEs and demand has negatively insignificant association with monthly revenue whereas all the rest predictors have positive association with monthly revenue. The overall regression model is statistical significant (). Similarly, the determination of coefficient () shows, the 72.3% of the variability is explained by model. In short, the given predictors included in the model explain 72.3% of the variability in monthly revenue of MSE. This also measures the goodness of fit of the model. Therefore, it indicated that the regression model is moderately good fit.

Generally, the findings have shown that, although few numbers of enterprises have shown improvement in growth pattern, majority of the enterprises are still stable as stagnant and some of them have shown the decline pattern. The main reason mentioned by the respondents are lack of amount of startup capital, lack latest technology, power interruption and lack of technical skill as the major causes.

### **Recommendation**

According to the major findings of this study the MSE sector faces a lot of challenges. In order to overcome the challenges, it needs effort from government, NGOs and all other stakeholders, therefore, the concerned bodies should make attention on the development of MSEs and avoid constraints that hinder the growth performance of MSEs. Therefore, the following recommendations are drawn based on the findings and conclusion.

With regard to infrastructure, the study results indicated that power interruption is one of the most challenging factor to manufacturing enterprise growth in Adigrat city. Government and stake holders could promote and facilitate the growth of MSEs by accessing necessary infrastructure facilities like electric city, road, water etc

Market linkage is another constraint of MSEs operators in the study area. Hence, government should protect micro enterprises from large enterprises in order to get market for their commodities, by providing subsidies like tax exemption until they stand by their feet in addition to this local government, NGOs and other stakeholders are expected to search market alternatives to link MSEs with organizations who need MSEs products. Moreover, the local government is recommended to create market linkage for micro and small manufacturing enterprises with large industries, with farmers and so on.

Based on the findings, the supports given by the governments and NGOs have been yet unsatisfactory; therefore, it is recommended that the government and NGOs should take careful look and attention to solve these serious challenges of several motive individuals at starting enterprises.

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