

Ethiopian Journal of Economics

Volume XXV

Number 1

April 2016

Table of Contents

Growth Potential and Business Constraints of Micro and Small Enterprises in South Wollo Zone, Amhara Region, Ethiopia 1

Addisu Molla

Impacts of Smallholder Tree Plantation in Amhara Region of Ethiopia: The Case of Lay Gayint and Fagta Locuma Districts 35

Fentahun Addis, Surafel Melak, Berihun Tefera and Habtemariam Kassa

Growth, Structure and Firm Dynamics in Grain Markets: The Case of Grain Traders in Ethiopia..... 59

Tadele Ferede, Mulat Demeke, Wolday Amha, Kindie Getnet

Informal Crossborder Livestock Trade Restrictions in Eastern Africa: Is there a case for free flows in Ethiopia-Kenyan Borderlands? 95

Wassie Berhanu

Trade Reforms, Mark-Ups and Bargaining Power of Workers: The Case of Ethiopian Manufacturing Firms 121

Worku Gebeyehu

**A Publication of
THE ETHIOPIAN ECONOMICS ASSOCIATION
(EEA)**

©Ethiopian Economics Association

VOLUME XXV

NUMBER 1

April 2016

Published in March 2017

Growth Potential and Business Constraints of Micro and Small Enterprises in South Wollo Zone, Amhara Region, Ethiopia

Addisu Molla¹

Abstract

In Micro and Small Enterprises (MSE) sector a thorough examination of factors that constrain enterprises growth is critical to the survival and growth of the enterprises. This paper, therefore, utilized the data collected on 224 MSEs in south Wollo zone of Amhara Region, Ethiopia to analyze the extent to which the growth of MSEs is linked with the constraints. Three sets of models were employed. The MSEs employment growth was significantly and negatively affected by limited access to finance, limited access to business services, and limited access to market. In addition, limited access to premises, limited access to finance and limited access to business services were significantly and negatively affect the operators' perception on growth potential of enterprises income. Therefore, the results highlight that the growth of MSEs are highly influenced by accesses of productive resources and assets. The analysis and findings, on the other hand, should help to professionals in such field of study. On the other hand, it should help shed some light for policy makers and anyone else who may have a stake on the small business development as a positive knock on effect for growth of MSEs.

Key words: business constraints, growth potential, principal components, MSEs, south wollo.

JEL Classification: D220

¹ PhD, Assistant Professor in Economics, Director, Continuing and Distance Education Directorate
Wollo University, Dessie, Ethiopia
E-mail: addisumolla@yahoo.com

1. Introduction

The international community has given a great deal of emphasis to Micro and Small Enterprises (MSEs) sector under the premise that it plays a critical role in addressing both poverty reduction and economic growth goals. MSEs play multifaceted role such as boosting competition, innovation as well as development of human capital and creation of a financial system. With increased urban population dynamics, the importance of MSEs is also growing in developing countries. For instance, in Barbados, it is believed that there are approximately 6000 MSEs and they account for approximately 80% of all business activity in the island (ILO, 2000). In Sub-Saharan Africa, given the rapid rural-urban migration and deficiency to absorb this migration, MSEs have become important urban economic activities particularly providers of urban employment (Elias, 2005).

In November 1997, the Ethiopian Ministry of Trade and Industry (MoTI) published the "Micro and Small Enterprises Development Strategy: MSEDs", which enlightens a systematic approach to alleviate the problems and promote the growth of MSEs. Following the publication of MSE development strategic document, the government of Ethiopia set up Federal Micro and Small Enterprise Development Agency (FeMSEDA). The regional states also developed MSE promotion strategies based on their context and in tandem with the federal MSEDs so that the states structured Regional Micro and Small Enterprises Development Agencies (ReMSEDA) to facilitate implementation of the strategies. Thus, in cities and towns of Ethiopia, MSEs and informal sector in general are the predominant income generating activities and thus they have a significant contribution to local economic development and used as the basic means of survival (Gebre-egziabher and Demeke, 2005).

Despite the fact that MSEs have been recognized as a major contemporary source of employment and income in a growing number of developing countries, yet relatively little is known and emphasized about the characteristics and growth of these enterprises specific to the chosen study area in the present study. In a study by Belay (2000), it is reported that 98% of business firms are micro and small enterprises out of which small enterprises

represent 65% of all businesses. The fact that the majority of enterprises are micro and small indicates that established enterprises find it difficult to grow to the next stages of middle and large scale industries. Although the MSE sector takes large proportion in the industrial sector, it contributes about only 3.4% of the GDP, 33% of the industrial sector's contribution to the GDP of the same year (Gebrehiwot G., 2006). Therefore, the MSEs are unable to grow at their full potential and hence contribute less to the national economy due to the existence of so many business constraints in the sector.

According to the study by Wolday and Gebrehiwot (2004) the leading factors contributing to the unimpressive growth and performance of the MSEs are limited access to finance, market, business services, working premises. Thus, critical assessment of the association between growth and constraints of enterprises is needed so as to achieve the contributions of their growth to the national economy by overcoming a series of constraints they are facing. This study, therefore, examines the extent to which the growth potential of MSEs is associated with the business constraints while controlling for the owner-managers' attributes and enterprises' characteristics.² The paper hypothesizes the following: firstly, access to productive resources is expected to have a significant positive effect on growth potential of MSEs. Secondly, MSEs operators' perception on growth potential of their income is highly influenced by business constraints.

2. Data and Methods

2.1 Source of Data and Sampling

The data set used for this study is based on primary data collected from three city administrations (Dessie, Kombolcha and Haik) of the south Wollo zone in Amhara region through a sample survey of enterprises. These towns of city administrations are chosen using purposive sampling method as they are areas with a high concentration of MSEs and are the primate cities in the

² Owner-managers' attributes include age, gender, marital status, family size, educational level, working experience and motivation to start the business and previous occupation of the operator whereas enterprises' characteristics include location, sub-sector, age, size-group, source of finance and legal ownership of the enterprises.

zone. A survey questionnaire was developed to fit the situation of the study areas and to collect all the necessary data and thus to test the hypotheses developed. During the survey three local enumerators were recruited and they received two days training. These enumerators were well experienced and they collected the data under strict supervision by the researcher.

Using a proportional stratified sampling technique to include representative enterprises in each city and kebelles under each city, a total of 224 enterprises were taken under the study from the above stated towns. A fixed, constant proportion (sampling fraction) of about 7 percent was selected from the target population³ to make up the stratified random sample. 7 percent sampling fraction is satisfactory sample fraction by taking into account the relatively high search costs of collecting data from spatially dispersed sampling units (Lyne, 2003). Respondents were randomly sampled from each town with the help of simple random sampling technique.

2.2 Methodology of the Study

The study employed analytical methods to analyze the growth of MSEs. Three sets of models were utilized: the principal component analysis-PCA, the multiple regression analysis and the logistic regression analysis. To this end, the first set of model PCA is a multivariate technique of analysis used to transform the original large set of explanatory factors (potential constraints) into smaller set of constraints which helps for further analyses in the subsequent regressions. The multiple regression aims to identify the association between growth and constraints of enterprises while controlling other determinants of growth and it also identify which constraint is significant for the model as well as its degree of extent in influencing the dependent variable. The third set of model, the logit model, was employed to analyze the perception of owner-manages on growth potential of enterprise income with the constraints given control variables. A detailed and well-structured enterprise level questionnaire that assesses large number of

³ The target population refers the total number of MSEs in the three towns which is 3369.

demographic, socioeconomic and business constraint related variables is utilized.

2.2.1 PCA as Multivariate Technique

As the first set of the model PCA is a useful multivariate technique of analysis in variable reduction procedure. It is useful when we have obtained data on a number of variables (possibly a large number of variables), and believe that there is some redundancy in those variables. In this case, redundancy means that some of the variables are correlated with one another, possibly because they are measuring the same construct. Because of this redundancy, it is believed that it should be possible to reduce the observed variables into a smaller number of principal components (artificial variables) that will account for most of the variance in the observed variables. Its goal is, therefore, to reduce the dimensionality of the original dataset with minimal information loss (Manly, 1986). A smaller set of uncorrelated variable is much easier to understand and use in further analysis than the largest set of correlated variables (Dunteman, 1999).

The smaller dimensions of variables that are derived from the original variable are called principal components (PCs). Only the first few components account for meaningful amounts of variance, are computed and extracted. So only these first few components are retained, interpreted, and used in subsequent regression analyses: the multiple regression analysis and the logit regression analysis. To determine the number of such “meaningful” components to retain there are some criteria used such as eigenvalue greater than one criterion, scree plot test, proportion of variance accounted for criterion and interpretability criterion. In this study, eigenvalue greater than one criterion, which is one of the most commonly used criteria for solving the number-of-components, is used. With this approach, we retain and interpret any component with an eigenvalue⁴ greater than 1.00. This criterion is also known as the Kaiser criterion (Kaiser, 1960).

⁴ Eigenvalue is a scalar or a simple real number computed from a square matrix and it refers the variance of the new variables.

Having the theoretical relevance and inter-linkage of PCA and the subsequent regression analyses to the analysis of growth in MSE sector from the above discussion, the following section provides the conceptual framework used in modeling MSE growth. To do so, the starting point is the estimated linear function of the principal components:

$$x = a_1v_1 + a_2v_2 + \dots + a_Nv_N \quad (2.1)$$

Equation (2.1) represents a higher-dimensional space (N) where v_1, v_2, \dots, v_N is a basis of the N-dimensional space and a_1, a_2, \dots, a_N is the loading.

$$\hat{x} = b_1u_1 + b_2u_2 + \dots + b_Ku_K \quad (2.2)$$

Equation (2.2) represents the lower-dimensional space (K) derived from the above larger dimensional space where u_1, u_2, \dots, u_K is a basis of the K-dimensional space and b_1, b_2, \dots, b_K is the loading. Note that dimensionality reduction implies information loss, which is indicated by the difference of subtracting the vector of lower dimension from the vector of higher dimension. i.e $(x - \hat{x})$, which is also called error.

Thus, the main intention here should be minimizing this error to come up with lower dimensional space with minimal information loss. So that the best low-dimensional space can be determined by the "best" eigenvectors of the covariance matrix of x (i.e., the eigenvectors corresponding to the "largest" eigenvalues -- also called "principal components"). As can be seen in Jain *et al.* (2000), this task can be accomplished through the following step-wise mathematical formulations. Suppose x_1, x_2, \dots, x_M are $N \times 1$ vectors or matrix. The mean of these vectors is computed as:

$$\bar{x} = \frac{1}{M} \sum_{i=1}^M x_i \quad (2.3)$$

Subtract the mean from each variables x_i and then form an $N \times M$ matrix that is consisted from mean corrected elements. Let's assume this matrix is said to be matrix A.

$$\phi = x_i - \bar{x} \tag{2.4}$$

$$A = \left[\begin{array}{cccc} \phi_1 & \phi_2 & \dots & \phi_M \end{array} \right] \tag{2.5}$$

The covariance of matrix A is obtained by:

$$C = \frac{1}{M} \sum_{n=1}^M \phi_n \phi_n^T = AA^T \tag{2.6}$$

Next compute the eigenvalues ($\lambda_1, \lambda_2, \dots, \lambda_N$) and eigenvectors (u_1, u_2, \dots, u_N) of the covariance matrix. Since C is symmetric, u_1, u_2, \dots, u_N form a basis, (i.e., any vector x or actually $(x - \hat{x})$, can be written as a linear combination of the eigenvectors):

$$x - \bar{x} = b_1 u_1 + b_2 u_2 + \dots + b_N u_N = \sum_{i=1}^N b_i u_i \tag{2.7}$$

Finally the optimal lower dimensional space is determined by keeping only the terms corresponding to the K largest eigenvalues (in most cases eigenvalues greater than one):

$$\hat{x} - \bar{x} = \sum_{i=1}^K b_i u_i \quad \text{Where } K < N \tag{2.8}$$

Therefore, the best lower-dimensional space K is derived from the higher-dimensional space N with minimal loss of information. So that u_1, u_2, \dots, u_K is the newly formed basis for the lower-dimensional space.

Once the conceptual framework of the PCA is discussed, the next step is presenting the conceptual framework of the subsequent regressions followed by PCA. With regard to the multiple regression analysis, although theoretically alternative measurement tools such as growth rate of sales or

profits could give more precise results, in practice they are not as credible as the employment growth measure because of entrepreneurs' hesitation to report the true values of their sales and profits. This hesitation, which leads to measurement errors, makes the employment-based measure preferable in studies considering enterprise growth.⁵ Moreover, in a relatively high inflationary economy, avoiding data in value terms is preferable, so using the employment growth rate as the measurement tool is beneficial. In addition, taking employment as measure of enterprises growth needs to be consistent with the goal set for the sector.

As far as the employment growth is concerned, the very critical issue that has to be raised is that employment growth is defined. Although there are different growth measures in literature, the Compound Annual Growth Rate (CAGR) is used in several studies of employment growth than other measures of employment growth (Liedholm and Mead 1999). The CAGR is a rate of growth that tells what an enterprise growth in employment over the years on an annually compounded basis.

With regard to the logit model, it is extremely flexible and easily used function. In addition, this model leads itself to meaningful interpretations when the dependent variable is dichotomous outcome (Gujarati, 1998). Thus, the logistic regression is a powerful tool in its ability to estimate the individual effects of the continuous or categorical variables on the qualitative dichotomous dependent variable (Wright, 1995). Following Gujarati (2004) the logistic distribution function for the relationship between the probability of the dependent dichotomous variable and various independent variables can be specified as:

$$P_i = E(Y = 1/x_i) = 1/(1 + e^{-(B_0 + B_1 x_i)}) \quad (2.9)$$

For ease of exposition this can be written as:

$$P_i = 1/(1 + e^{-Z_i}) = e^{Z_i} / (1 + e^{Z_i}) \quad (2.10)$$

⁵ See Liedholm and Mead (1999) for a comprehensive justification of this issue.

Where P_i is the probability that the enterprise experience growth in income and it ranges between 0 and 1 and it is nonlinearly related to Z_i (i.e. the explanatory variables X_i 's). e^{Z_i} standards for irrational number e to power of Z .

Z_i is the function of n-explanatory and control variables (X_i) which is also expressed as:

$$Z_i = B_0 + B_1x_{1i} + B_2x_{2i} + \dots + B_nx_{ni} \quad (2.11)$$

Where, $X_1, X_2, \dots, X_n =$ explanatory variables; $B_0 =$ is the intercept; $\beta_1, \beta_2, \dots, \beta_n$ are the logit parameters (slopes) of the equation in the model. If P_i is the probability of the growth potential of enterprise income is increased. $(1-P_i)$, the probability of the growth potential of enterprise income is not increased, which can be written as:

$$1 - P_i = 1/(1 + e^{Z_i}) \quad (2.12)$$

Thus, the expression $P_i/(1-P_i)$ is known as the odd-ratio and can be written as:

$$P_i / (1 - P_i) = \left[(e^{Z_i} / 1 + e^{Z_i}) / (1 / 1 + e^{Z_i}) \right] = e^{Z_i} \quad (2.13)$$

Taking the natural log of eq. (3.19), we can get:

$$L_i = \ln(P_i / 1 - P_i) = Z_i = B_0 + B_1x_i \quad (2.14)$$

Where L_i , is log of the odds ratio, which is not only linear in X_i but also linear in the parameters. Finally, by introducing the residual term U_i we get the theoretical logit model which is given as:

$$Z_i = B_0 + B_1x_{1i} + B_2x_{2i} + \dots + B_nx_{ni} + U_i \quad (2.15)$$

2.2.2 Specification of the Model

In this study both descriptive and econometric analyses were employed. With regard to the descriptive analysis the summary statistics such as percentages and means were used to examine the nature and structure of MSEs found in towns of the south Wollo zone. In econometric analysis, three sets of models were utilized: the principal component analysis-PCA, the multiple regression analysis and the logistic regression analysis. To this regard, the first set of model PCA is a multivariate technique of analysis used to transform the original large set of correlated variables (potential constraints)⁶ into smaller set of uncorrelated variables also called principal components-PCs. Its goal is to reduce the dimensionality of the original data set with minimal information loss (Manly, 1986). Therefore, the purpose of employing this model is to obtain meaningful interpretation of the PCs and hence to use them in further analysis in the subsequent regressions of the next two sets of models. A smaller set of uncorrelated variable is much easier to understand and use in further analysis than the largest set of correlated variables (Dunteman, 1999).

The PC's can be estimated as linear functions of the original 16 variables (constraints) per Equation (2.16):

$$PC_i = a_{i1}x_1 + a_{i2}x_2 + \dots + a_{i16}x_{16} \quad (2.16)$$

Where $i = 1 \dots 16$; $a_{i1} \dots a_{i16}$ = the component loadings which represents the i^{th} PC and 1st-16th constraint; and $X_1 \dots X_{16}$ = the 16 constraints listed in appendix A.1.

The multiple regression aims to identify the association between growth and constraints of enterprises while controlling other determinants of growth and

⁶ See the constraints on Appendix Table A.1 and thus the study takes values for all constraints by assigning numbers 1, 2, 3, 4, and 5 for the degree of severity of the constraints: sever constraint, major constraint, moderate constraint, minor constraint and no constraint at all respectively as five-point-scale measurement. This is obtained by asking the respondents to give response on the degree of severity of constraints according to the extent to which the constraints affect their enterprise growth.

it also identifies which constraint is significant for the model as well as its degree of extent in influencing enterprise growth. The very important issue as far as growth of enterprises is concerned is that how enterprise growth is defined and measured. In this regard, turnover (revenue), sales (output), value added, assets, and number of workers are predominant measures of enterprise growth.

Among these alternatives the most frequently used one is a change in number of employees over the years since start up particularly in those studies of developing countries (Liedholm and Mead, 1999; USAID, 2002). Because this indicator is the most easily and accurately remembered over time by respondents; and also does not be deflated. In addition, among different techniques⁷ of measuring employment growth, the one that is known as Compound Annual Growth Rate (CAGR) is employed in this study. Because it is the most widely used and gives a much more precise assessment of the timing of employment growth effects (Liedholm and Mead, 1999). CAGR is a rate of growth that tells what an enterprise growth in employment over the years on an annually compounded basis is measured in percent and its formula is presented as:

$$\left[(CE / IE)^{1/EA} - 1 \right]^8 \quad (2.17)$$

Thus, the multiple regression can be specified as:

$$egrth_i = a + \beta_1 const_i + \beta_2 contrv_i + e_i \quad (2.18)$$

Where *egrth* refers to growth of the enterprises measured as employment growth, β_1 and β_2 are parameters to be estimated, while 'a' and 'e' are the constant and the error term respectively. The terms *const* and *contrv* are vectors of constraints refer to problems encountered by MSEs and control variables such as demographic and socio-economic variables. And the term *i* stands for a respective enterprise which ranges from 1-224.

⁷ The different techniques of measuring employment growth are Average Annual Growth Rate (AAGR), Compound Annual Growth Rate (CAGR) and Average Annual Growth in Jobs (AAGJ).

⁸ The designations CE, IE and EA refer current employment, initial employment and enterprise age respectively.

The third set of model, the binary logit model, was employed to analyze the effect of constraints on perception of owner-managers towards growth potential of enterprise income. To measure the perception the dummy variable income growth (ingrow) is constructed as dummy one if operators perceive that an enterprise experiences growth in income and zero otherwise. This shows the probability that the enterprise will experience growth in income while controlling for other factors. That is the conditional expectation of growth potential of income given the constraints and control variables and can be specified as:

$$E[\text{ingrow}_i/\text{const}_i, \text{contrv}_i] = P[e_i > -V(\text{const}_i, \text{contrv}_i)] = F[(\text{const}_i, \text{contrv}_i)] \quad (2.19)$$

Where e_i is a disturbance term; P is the probability distribution function and F is the cumulative normal distribution function. The term i and the vectors const and contrv are defined as earlier.

3. Results and Discussions

3.1 Descriptive Results

3.1.1 Owner-managers' Attributes and Enterprises' Characteristics

Regarding the owner-managers' or operators' attributes 63% of sample enterprises were owned and/or managed by men and the rest 37% of enterprises were owned and/or managed by women. This indicates that women's participation in the business activities particularly in heading the enterprises is relatively lower. This may be attributed mainly to the cultural norms and societal attitudes, which consider women as inferior and too much family responsibilities they have to bear instead of engaging in businesses.

As can be seen in Table 3.1, the owner-managers lowest age is 18 while highest age is 72, and thus the mean age is 31.8. Only 16% of the operators had at least secondary school education and the majority either attended primary education or have no education at all (illiterates). The mean value of experience of owner-managers is about 3.6 years. Therefore, from the studies it is clearly indicated that business opportunities are skewed towards younger, less educated, less experienced and male group operators.

Table 3.1: Variables used in the models with summary statistics

Variables	Description	Mean	Std. Dev	Min.	Max.
Gender	Gender of the operator (dummy: gender=1 if the operator is male; and 0 otherwise)	0.63	0.48		
age	Age of the operator in years	31.8	9.50	18	72
Mrst	Marital status of the operator (dummy: mrst=1 if the operator is married; and 0 otherwise)	0.51	0.50		
educ	Education of the operator (dummy: educ=1 if the operator at least completed secondary school; and 0 otherwise)	0.16	0.36		
exp	Experience of the operator in years	3.63	5.42	0	27
fmlsize	Family size of the operator	3.75	2.06	0	11
Positn	Position of the operator in the enterprise (dummy: positn=1 if the operator is the owner and manager of the enterprise; and 0 otherwise)	0.14	0.35		
motivn	Motivation of the operator (dummy: motivn=1 if the operator is self motivated; and 0 otherwise)	0.31	0.46		
Preoccupy	Previous occupation of the operator (dummy: preoccupy=1 if the operator was unemployed or jobless; and 0 otherwise)	0.57	0.49		
othrinvt	Engagement of the operator on other investment (dummy: othrinvt =1 if yes; and 0 otherwise)	0.25	0.43		
locn	Location of the enterprise (dummy: locn=1 if Dessie; and 0 otherwise)	0.44	0.50		
Entage	Age of the enterprise in years	3.68	3.19	1	19
legform	Legal ownership form of the enterprise (dummy: legform=1 if cooperative; and 0 otherwise)	0.46	0.50		
subsec	Sub-sector of the enterprise (subsec=1 if textile & garment, wood & metal work and construction; and 0 otherwise)	0.58	0.49		
entsize	Size-group of the enterprise (dummy: entsize = 1 if micro enterprise; 0 otherwise)	0.70	0.46		
finsrs	Finance source of the enterprise (dummy: finsrc=1 if own source; and 0 otherwise)	0.42	0.49		

Source: Computed from own survey data, 2010

Based on the enterprise characteristics, the sample enterprises in this study have a mean of 3.68 years in business. With regard to the activities practiced in the study, 58% of the enterprises are engaged in construction, wood and metal work and textile and garment sub-sectors while 42% are engaged in food processing, urban farming and municipal activities. Of the sample enterprises, 46% were registered as cooperative type of legal ownership and the rest 54% were registered as partnership and sole proprietorship type of legal ownership. 42% of enterprises capital came from internal or own sources of finance, especially personal savings of owner-managers; the rest 58% comes from other sources such as financial assistance from their relatives and friends, financial assistance from NGOs and loan from formal and non formal financial institutions. With respect to the size-group of enterprises in the MSE sector, of the total sample enterprises most of the enterprises (70%) are micro enterprises and the rest 30% are small-enterprises.

3.1.2 Growth of Enterprises

The mean number of workers at start-up and current time for sample MSEs are 8 and 10 respectively; the range varies from 1 to 28 for start-up employment and from 1 to 51 for employment at current-time. The mean capital of MSEs during their start-up was 10,283.26 birr and the current average capital is 27,221.63 birr. The mean capital-labor ratio for start-up is 1619.84 implying that on average 1619.84 birr employed only one labor at the start up of enterprises. Similarly, the current mean capital-labor ratio is 3527.84. Intuitively, the capital-labor ratio comparison between at start up and currently shows that capital grew faster than employment and hence the enterprises became more of capital intensive (See Appendix A.2).

Having different techniques of employment growth measures⁹ by size-group, micro enterprises grew on a mean of 0.13% and 0.16% annual compound

⁹ The different techniques of measuring employment growth include Average Annual growth Rate (AAGR), Compound Annual Growth Rate (CAGR) and Average Annual Growth in Jobs (AAGJ). ACGR tells what an enterprise growth in employment over the years on an annually compounded basis which is measured in percent; AAGR tells the average increase in the employment over the years since start up measured in

growth rate and average annual growth rate respectively (See Appendix A.3). Also small enterprises grew on a mean of 0.09% and 0.14% annual compound growth rates and average annual growth rates respectively. This shows that the micro enterprises growth performance is relatively better than small enterprises. However, in terms of annual jobs added, the small enterprises growth performance exceeds that of micro enterprise. Because, small enterprises have increased 0.8 number of job per enterprise annually while micro enterprises have increased 0.74 number of job per enterprise annually.

The overall growth performance of MSEs in the study area indicates that the enterprises grew very much weakly compared to other developing countries experience on the same growth measures. For instance, small enterprises in Botswana and Zimbabwe have grown by 6.3% and 5.6% of annual compound growth rate respectively and by 8.4% and 7.4% of annual average growth rates respectively (Liedholm and Mead, 1999).

3.2 Econometric Results

3.2.1 Principal Component Analysis of Potential Constraints to MSEs Growth

PCA, as variable reduction technique, reduces large set of potential constraints into smaller set of constraints by extracting certain number of components. Although the number of components extracted in PCA is equal to the number of observed variables being analyzed, only those PCs with an eigenvalue greater than one (i.e., the first six components) are derived from 16 potential constraints (See Appendix A.4). Eigenvalues are scalars that give the variance of the PCs and thus eigenvalue greater than one criteria (or Kaiser's criteria) is the default criteria used to determine the number of PCs that are retained, interpreted and used in subsequent analyses (Kaiser, 1960).

Compared to the other alternative criteria¹⁰ that determine the number of PCs extracted, the Kaiser's criterion gives a meaningful and maximum amount of

percent; AAGJ tells the average annual growth in jobs created per enterprise since start up measured in number.

¹⁰ The alternative criteria for determining the number of PCs include; scree test, proportion of variance accounted for criterion and interpretability criterion.

variance of the model. Based on their respective eigenvalues as indicated in appendix A.4, the six retained components accounted for 21.1%, 14.9%, 8.7%, 7.9%, 7.6% and 6.5% respectively from the first PC to the sixth PC and hence all the PCs together accounted for 66.7% of the variation in the data. On the basis of the Nunnally (1967) recommended standards of the reliability coefficients of the PCs (i.e., cronbach $\alpha \geq 0.60$ for the reliability of each of the factors or PCs and cronbach $\alpha \geq 0.70$ for the composite reliability of PCs) to insure that they are reliable indicator of the data set and hence explain the meaningful amount of the variance, the PCs are good and suitable to be used and the variance explained by these PCs (66.7%) became meaningful amount of variance.¹¹

The Component Loadings

This section discusses about correlation among the variables. The simple correlation between the original and the new variables, also called loadings, give an indication of the extent to which the original variables are influential or important in forming new variables. Therefore, each principal component is formed based on the loadings of the variables (constraints). The higher the loadings of a variable, the more influence it has in the formation of a given PC and vice versa and hence the loadings were used to determine which variables are influential in the formation of a given PC and to assign a meaning or label for the PC. This was done by rotating the components using orthogonal varimax rotation method. In the varimax rotation the main objective is to have a factor structure in which each variable loads highly on one and only one factor.¹² That is, a given variable should have a high loading on one factor and near zero loadings on the other factors.

¹¹ Because the cronbach's alpha for each of the PC and for the composite of PCs are confirming to the Nunnally's recommended standards as indicated on appendices A.5a and A.5b.

¹² The rationale for choosing orthogonal varimax rotation is that it is the orthogonal but not the oblique rotation that gives the uncorrelated PCs. In addition, the interpretation of factor structure resulting from an oblique rotation is more complicated than that resulting from orthogonal rotation particularly varimax rotation which is the most commonly used rotation in many researches (Sharma, 1996).

The Principal Components

It is often necessary to interpret or provide a meaning to the principal components that are the linear combination of the original variables. The six factors or PCs indicated on Table 3.2 are named or labelled firstly by observing which variables are having higher loading on each component and then trying to find a general name on the basis of the variables that had high loadings to a single component. In order to answer how high the loading should be before we can say that a given variable is influential in the formation of a PC, a loading of 0.50 or above need to be used as a cutoff point (Sharma, 1996). Even some researchers have used a cutoff values as low as 0.40. With this framework, the researcher tried to categorize the variables into six factors and then interpret the factors as it was indicated in Table 3.2.

For example, Inadequate operation space and selling outlet, insufficient technology and lack of access to physical infrastructure are the three items that are dealing with lack of access to working premises and other infrastructures and hence factor 1 is labelled as 'limited access to premises'. Factor 2 was also defined as 'limited access to finance' as limited access to working capital, limited access to start-up capital and lack of collateral had relatively high loadings for this factor and all they are elements fall in financial matters. In similar fashion, the rest PCs are labelled or named as limited access to business services; limited access to market; unfavourable government policy and weak institutional linkage.

Use of Principal components

Besides deriving manageable and meaningful constructs, PCA also derive the principle component scores that are used in subsequent analyses. Principal component scores are calculated from the eigenvectors that give weights used for forming the equation to compute the new variables. These principle components, therefore, used as input variables for further analyzing the data using the forthcoming regression analyses. Since the principle of component scores are computed from the weights of principal components and mean-corrected data of the variables they are the weighted -sum of all the observed variables being analyzed (Sharma, 1996; Ayalew, 2007). The next two sections use the scores to further analyzing the data by employing the two set of models, which are the multiple regression and the binary logit models.

Table 3.2: Rotated component loadings matrix of potential constraints of enterprise growth

Factor (Principal component-PC)	1	2	3	4	5	6
Eigenvalue	3.373	2.386	1.385	1.270	1.222	1.034
Percentage of variance explained	21.1	14.9	8.7	7.9	7.6	6.5
Potential constraints on growth Of enterprises	Limited access to premise	Limited access to finance	Limited access to business services	Limited access to market	Unfavourable gov't policy	Weak institutional linkage
Limited access to working capital	-0.072	0.656	-0.053	0.011	-0.068	0.002
Limited access to start up capital	0.048	0.575	0.078	-0.118	0.124	-0.055
Limited access to business counseling /advise	-0.042	0.082	0.584	0.012	0.068	0.001
Inadequate operation space and selling outlet	0.714	-0.027	-0.128	-0.170	0.155	-0.098
Insufficient technology	0.533	0.084	-0.003	0.039	-0.017	0.068
Lack of collateral	0.097	0.492	0.073	0.092	-0.109	0.043
Lack of access to physical infrastructure	0.504	-0.049	0.172	0.184	-0.159	0.031
Limited access to skill training	0.071	0.117	0.493	-0.059	-0.141	0.012
Lack of information access	-0.016	-0.132	0.578	0.021	0.112	-0.025
Unable to compete with large enterprises	0.055	-0.180	0.078	0.715	-0.049	-0.057
Inadequate demand for the product/service	-0.044	0.229	-0.161	0.597	0.153	0.022
Weak linkage between MSEs & gov't institutions	0.098	-0.030	-0.006	0.035	-0.096	0.570
Weak linkage between MSEs & private institution	-0.065	0.023	0.013	-0.040	0.044	0.564
Weak linkage between MSEs & large enterprises	0.005	-0.006	-0.015	-0.009	0.069	0.575
Too many and complex rules and regulations	-0.004	-0.045	0.089	-0.048	0.638	0.047
Bureaucracy in licensing and registration	-0.001	0.018	-0.037	0.092	0.658	-0.013

Source: computed from own survey data, 2010

3.2.2 Business Constraints and other Factors Inhibiting the Growth of MSEs

The multiple linear regression analysis is used to analyze the extent to which the growth of MSEs is associated with the constraints of enterprise growth. In the regression, the PCs have entered with their own scores from PCA into the regression so that they represented the business constraints with six constructs such as limited access to premises; limited access to finance; limited access to business services; limited access to market; unfavourable government policy and weak institutional linkage. In addition, several control variables were included in order to come up with the genuine association between the PCs and the growth of enterprise.

The estimation result of the multiple regression is presented in Table 3.3. Regarding the constraints of enterprise growth the variables such as limited access to finance, limited access to business services and limited access to market were found to be important in explaining growth of the enterprises in the study area and hence became statistically significant at 10%, 5% and 10% levels of significance respectively. The signs for these variables are negative, revealing strong inverse relationship between the constraints and growth of enterprises. The coefficients for these variables explain the magnitude of the constraints towards affecting the growth of enterprises. Limited access to business services found to be the most influential factor in determining enterprise growth followed by access to finance and access to market, respectively. Thus, the importance of accesses of various productive resources (finance and Business services) and access to market for MSE sector is worth considering for policy makers as a positive knock on effect for MSEs.

Indeed, the significant variables do not have equal influence on the growth of enterprises with some descriptive characteristics of the owners and the enterprises. For instance, legal form and enterprise size are statistically significant to indicate the existence of unequal influence of variables such as the productive resources and accesses to market on legal ownership of the enterprise and size-group of the enterprise. More specifically, the employment growth of the cooperative enterprises is highly affected by these variables than that of sole proprietorship enterprises. Similarly, the influence of these

variables on the growth of microenterprises is much bigger than that of small enterprises. However, variables like gender and age of the operator are not significant so that for gender aspect it can be inferred that the influence of the variables on the growth of enterprises led by men and women is not significant.

Table 3.3 Effects of constraints and other factors on growth of MSEs

Variables	Coefficients	Std. Error
Limited access to premises (accprem)	-0.096	0.129
Limited access to finance (accfin)	-0.224*	0.122
Limited access to business services (accbs)	-0.274**	0.130
Limited access to market (accmkt)	-0.208*	0.125
Unfavourable government policy (gvtpolc)	-0.054	0.124
Weak institutional linkage (instlkg)	-0.030	0.126
Gender of the operator (gender)	0.071	0.134
Age of the operator (age)	0.016	0.031
Age squared (age ²)	-0.001	0.004
Marital status of the operator (mrst)	-0.047	0.134
Education of the operator (educ)	0.298*	0.172
Experience of the operator (exp)	-0.001	0.014
Family size of the operator (fmlsize)	-0.021	0.035
Position of the operator (positm)	0.299*	0.179
Motivation of the operator (motivn)	0.239*	0.134
Previous occupation of the operator (preoccup)	-0.118	0.125
Other investment by the operator (othrinv)	0.342***	0.126
Enterprise age (entage)	-0.251**	0.123
Location of the enterprise (locn)	-0.150	0.137
Legal ownership of the enterprise (legform)	-0.302**	0.135
Sub-sector of the enterprise (subsec)	0.066	0.129
Size-group of the enterprise (entsizg)	0.317***	0.119
Finance source of the enterprise (finsrc)	-0.134	0.129
Constant	1.593	0.618

* = Significant at 10% ** = Significant at 5% *** = Significant at 1%

F (23, 200) = 1.60; Prob > F = 0.046; R² = 0.1552

Source: computed from own survey data, 2010

As far as the owner-managers' attributes are concerned, the previous working experience of the owner-managers that they may have acquired prior to

starting up their business does not seem to influence growth of enterprises in the study area, even though, other researchers have found evidence that operators with prior work experience are more successful at raising growth (USAID 20002). Instead, the difference in performance of enterprises in the study area emanates from human capital related to the owner-manager. To this regard, education or having at least secondary education is statistically significant at 10% level of significance.

The estimated coefficients for variables position of the operator (*positm*) in the enterprise and motivation of the operator to start the business (*motivn*) are statistically significant at the 10% and have positive signs. i.e., enterprises led by the owners grow by 0.299% than those led by non-owner operators. Also enterprises established by self-motivated operators grow by 0.239% growth rate than those enterprises established by any other motivation of the operator specially those established due to lack of alternative likelihood.¹ This is also supported in the study conducted by Ishengoma and Kappala, 2008. According to this study, if the owner's motivation to establish the business is to be self-employed, then the business is likely to prosper; if the owner's motivation to start the business is to meet his/her household's subsistence needs, then the business is not likely to grow and perform well. The plausible explanation for the statistically significant positive effect of position and motivation is that if the manager is the owner and he/she is self motivated manager at a time, he/she will be dedicated for every measures and decisions that help to make the enterprise more prosperous.

Concerning to the characteristics of enterprise, enterprise age (*entage*) is statistically significant at 5% and negative. Thus, the younger the enterprises are the more likely they grow faster (by 0.251%). This result is consistent with Jovanovic's, 1982 model of passive learning model and competitive selection. That is, an additional year in the firm age implies a reduction employment growth rate by 0.076%. Legal form of business ownership (*legform*) is statistically significant at 5%. Growth rate of enterprises with cooperative

¹ Since the dependent variable (growth in employment) is computed by Average Compound Growth Rate (ACGR) in percent with the standardized formula the change in the dependent variable has to be presented in percent.

form of legal ownership decreased (by 0.302%) than those enterprises with the other form of legal ownership such as partnership and sole proprietorship.

This may be due to the fact that the policy guide to form a cooperative requires a minimum of ten members so that a cooperative starts with at least ten members and if all members are working in the cooperative, then from the beginning large number of workers is working in the cooperative. The need for an additional worker could be minimal. Moreover, even if a worker is added, the growth in terms of percentage could be minimal for the denominator in forming the percentage is already large. But if we look at a sole proprietorship or partnership forms of business, the need for additional workers could be indispensable from the beginning for there could be few workers to begin with. Moreover, if one worker is added, the percentage change in employment could be large because of the fact that there were only few workers working.

The size-group of enterprise is also found to be important in explaining growth. The variable is statistically significant at 1% and positive which reveals that micro enterprises register high growth rates than their larger counterparts.² This result corroborated with the results obtained in the descriptive analysis and also confirmed to the implication of theoretical models that smaller and younger firms should have higher and more viable growth rates (Stranova, 2001 and Goedhuys, 2002).

3.2.3 Linking Operators' perceptions on Growth potential of Income to Business Constraints

Since it is another pattern of dealing with growth of enterprises in terms of perceived income situation of the enterprises a set of explanatory variables used in the multiple regression analysis also involved in this model of binary logit model and hence the estimation results of the logit estimates are

² The size-group of the enterprise refers to the category of MSEs into two main groups as micro enterprises and small enterprises on the basis of the amount of capital acquisition and the number of employed workers as well. For further explanation see the Ethiopian ministry of trade and industry, 1997 and the central statistical authority of Ethiopia, 2003.

presented in Table 3.4. Accordingly, the first three variables limited access to premises, limited access to finance and limited access to business services significantly affect the income growth potential of enterprises. These variables are statistically significant at 1%, 1% and 5% respectively. Among these variables limited access to finance found to be most important determinant of enterprise growth in terms of income situation. This may be due to that banks and other financial institutions are usually reluctant to provide credit facilities to MSEs because lending to them brings less profit, high credit administration costs and greater risks. This is especially true when many enterprises are typically deficient in equity and acceptable collateral (Abdullah and Baker, 2000).

These results particularly the limited access to finance and limited access to business services complies with the results obtained in the multiple linear regression analysis in the previous section. These findings also corroborate with the other studies (eg. Ishengoma 2004b, Kimuyu 2004) that limited access to productive resources (finance and business services) is main obstacle to growth and performance of MSEs. In addition, the results also verify the already formulated alternative hypothesis in this study. That is, MSEs operators' perception on growth potential of enterprise income is highly influenced by business constraints.

The same descriptive variables raised in the multiple regression could also be taken in this logistic regression. To this regard, the variables such as productive resources and accesses to premises have different influential power on growth potential of enterprises income. Moreover, variables such as legal ownership of the enterprise, size-group of the enterprise and age of the operator also significantly affect the growth potential of income. Accordingly,, the growth potential of income in cooperative enterprises is more affected by these variables than that of sole proprietorship enterprises. Similarly, the influence of these variables on the growth of microenterprises is higher than that of small enterprises. With regard to age of the operator, enterprises run by younger operators are affected more than enterprises run by older operators.

Table 3.4: Logit estimates

Variables	Panel A: logit estimates		Panel B: the marginal effect (ME) after logit. y= Pr(ingrow) (predict) Thus, y = 0.46	
	Coeff.	Std.err	ME	Std.err
Limited access to premises	-0.901***	0.340	-0.221***	0.081
Limited access to finance	-1.329***	0.346	-0.319***	0.077
Limited access to business services	-0.326**	0.165	-0.181**	0.092
Limited access to market	-0.114	0.317	-0.028	0.079
Unfavourable government policy	0.292	0.319	0.072	0.079
Weak institutional linkage	0.035	0.323	0.009	0.080
Gender of the operator	-0.242	0.348	-0.060	0.086
Age of the operator	0.199**	0.089	0.049**	0.022
Age squared	-0.003**	0.001	-0.001**	0.001
Marital status of the operator	0.811**	0.349	0.199**	0.083
Education of the operator	0.067	0.454	0.017	0.113
Experience of the operator	0.006	0.034	0.001	0.008
Family size of the operator	0.103	0.089	0.026	0.022
Position of the operator	-0.279	0.468	-0.069	0.113
Motivation of the operator	-0.284	0.345	-0.070	0.084
Previous occupation of the operator	-0.443	0.323	-0.109	0.079
Other investment by the operator	0.065	0.389	0.016	0.097
Enterprise age	-0.161***	0.058	-0.039***	0.014
Location of the enterprise	0.488	0.352	0.121	0.087
Legal ownership of the enterprise	-0.759**	0.357	-0.186**	0.085
Sub-sector of the enterprise	-0.022	0.333	-0.006	0.083
Size-group of the enterprise	0.481*	0.272	0.194*	0.109
Finance source of the enterprise	-0.169	0.332	-0.042	0.083
Constant	-3.648	1.847		

* = Significant at 10% ** = Significant at 5% *** = Significant at 1%

Log likelihood = -128. 4286; LR chi² (23) = 52.80; Prob>chi² = 0.0004; Pseudo R² = 0.1705

Source: computed from own survey data, 2010

Concerning to the owner-managers attributes the variables age and age squared (age²) are statistically significant at 5%. The variable age is positive indicating that a probability that income experiences growth increased with age. But, the coefficient for age² is negative implies that the positive association between age of the operator and income growth of the enterprise does not continue throughout. It is only up to a certain level of age that both age and income growth goes together. But afterwards the relationship

becomes negative implying that at the early (young) age of the operator there is a positive probability that income experiences growth whereas at a later (old) age, it is just the opposite. For marital status, enterprises those led by married operators have a higher probability of income growth (19.9%) than those led by otherwise. This could be due to that married operators might get complementary supports from their spouse than unmarried operators although responsibility in the family could be an additional burden for married operators.

Regarding the characteristics of enterprises, enterprise age is negative and statistically significant at 1%, which indicated that young enterprises are more likely to grow faster than older ones. This result is consistent with the result in the case of growth in employment as discussed in the previous section. In addition, legal form of ownership and size-group of enterprise significantly influence income growth. That is, cooperative types of business have a lower level of probability to record income growth than other type of enterprises. With regard to enterprise size-group, the higher is the size of an enterprise, the lower the probability to experience income growth. Like enterprise age, the results of these two variables were confirmed with the results in the case of growth in employment.

Largely, the results in the two regression analyses reveal two important patterns. The first pattern concerns the employment growth of MSEs while the second pattern deals with the operators perception on the growth potential of enterprise income. With regard to the first pattern, the business constraints such as limited access to finance, limited access to business services and limited access to market are significantly and negatively affecting the employment growth of MSEs. On the basis of the second pattern, the business constraints such as limited access to premises, limited access to finance and limited access to business services are significantly and negatively affecting the growth potential of enterprise income. Hence, both patterns highlight that the growth of MSEs in the study area are highly influenced by the specified business constraints.

4. Conclusions and Recommendations

The aim of this study was to examine the extent to which the growth potential and performance of MSEs are associated with business constraints in the south Wollo zone of Amhara region. The study used a survey 224 MSEs focusing on the potential constraints and also firm owner specific characteristics that may influence the growth of the enterprises. Both descriptive and econometric tools were used to estimate and analyze the data.

The summary statistics in the descriptive analysis showed that most of the sample enterprises were operated by men and few of the owner-managers had secondary school education. The mean age of the operators is 31.8 and most of the enterprises had little experience in running the businesses. Therefore, the business opportunities were skewed towards younger, less educated, less experienced and male group operators. MSEs in the south Wollo zone started with an average paid up capital of 10, 283 birr and with an average of 8 employees. At the time of the study, enterprises included in the study had an average of approximately 27,221 birr paid up capital and 10 employees. The capital-labor ratio comparison between at start up and currently shows that capital grew faster than employment and hence the enterprises became more of capital intensive.

The regression results of the econometric analysis verified that business constraints particularly, limited access to market and productive resources (finance and business services) hinder the employment growth potential of MSEs. The employment growth of the cooperative enterprises is highly affected by these constraints than that of sole proprietorship enterprises. Similarly, the influence of these constraints on the growth of microenterprises is much bigger than that of small enterprises. So this clearly informs the concerned government bodies and some other stakeholders that much emphasis should be given to the cooperative type of enterprises and microenterprise so as to promote their growth.

In addition, when MSEs experience limited access to premises, limited access to finance and limited access to business services the growth potential of their income likely to decrease. Thus, the specified business constraints

are negatively and significantly affect the growth of MSEs. Particularly, limited access to productive resources such as finance and business services are the most important factors for MSEs to perform better and to grow. These factors have different influential power on legal ownership of the enterprise, size-group of the enterprise and age of the operator, but not on the gender of the operator. As a result, the growth potential of income in cooperative enterprises is more affected by these variables than that of sole proprietorship enterprises. Similarly, the influence of these variables on the growth of microenterprises is higher than that of small enterprises. With regard to age of the operator, enterprises run by younger operators are affected more than enterprises run by older operators.

Thus, any concerned body should be recommended to exert relatively much effort on cooperative enterprises, microenterprises and enterprises led by younger operators. As away out to financial constraints of MSEs a number of innovative mechanisms could be implemented. These include group lending approaches, small and increasing credit, and link of credit savings or micro financing institutions through NGOs. Furthermore, a guarantee schemes as such allocating finance exclusive to the MSE sector should be designed to support micro and small enterprises who cannot meet bank and financial collateral requirements.

With respect to the business services provided to the MSEs the stakeholders particularly the government should work more on the provision of services such as business counseling and advise, and skill training through establishing the MSEs operators training institutions so as to give short term and long term trainings for the enterprises operators. It is also advisable to create opportunities for the MSEs to share experiences at national and global levels through bazaars and trade fairs. This may help them to obtain better access to market, technology, knowledge and managerial skills.

When MSEs face market problems related to limited customers coupled with high competition, MSEs need to have access to differentiated market segments which operate without stiff competition. This may enable them to attain higher levels of turnover at lower transaction costs and, hence, higher profits. From the policy perspective, some practical measures like

involvement of MSEs in the public procurement market, and the strengthening of MSEs horizontal joint actions in the area of marketing should be undertaken by stakeholders to enhance MSEs' access to market. To mitigate the problems associated with access premises serving businesses with industrial land or working space is one feasible area of intervention to sustain the growth of enterprises. For example, the government should build commercial centers and transfer to the MSEs at low cost on credit basis.

References

- Abdullah, M. A. and Baker, M. (2000). *Small and Medium Enterprises in Asian Pacific Countries* (eds.), Science Publishers Inc., Huntington, New York.
- Ayalew, S. (2007). Empirical Impact Assessment of Business Development Services on Micro and Small Enterprises in towns of Amhara National Regional State Addis Ababa University School of Graduate Studies, Addis Ababa.
- Belay, G. (2000). Evaluation of the Performance of the Private Sector Economy in Ethiopia (1991-1999). Addis Ababa: Ethiopian Ministry of Trade and Industry.
- Central Statistical Authority. (2003). Urban Informal Sector Sample Survey. Addis Ababa, Central Statistical Authority of Ethiopia.
- Dunteman, G. (1999). *Principal Component Analysis: Quantitative Applications in Social Science*, Sage University, United Kingdom.
- Elias, B. (2005). Role of Micro and Small Enterprises in Local Economic Development, The Case of Awassa, in Tegegne Gebre-egziabher and Helmsing A. H. J (eds.), *Local Economic Development in Africa, Enterprises Communities and Local Government*, The Netherlands, Shaker Publishing.
- Federal Micro and Small Enterprise Development Agency (FeMSEDA). (2005). *Flier of Federal Micro and Small Enterprises Development Agency*, Addis Ababa
- Gebrehiwot, G. (2006). *Managerial Performance Measurement in Small Scale Industries*. Graduate Studies of Addis Ababa University, Addis Ababa.
- Gebre-egziabher, T. and Demeke, M. (2005). *Small Businesses in Small Towns of the Eastern Amhara Region: Nature and Economic Performance A Research Report on IDR*, Addis Ababa University.
- Goedhuys, M. (2002). *Employment Creation and Employment Quality in African Manufacturing Firms*. International Labor Organization, Geneva, International Labor office.
- Gujarati, D. (1998). *Basic Econometrics*, Third Edition, McGraw Hill Book Company, New York.
- International Labor Organization (ILO). (2000). *Profile of Employment and Poverty in Africa: Report on Ethiopia, Nigeria, Ghana, Tanzania, Kenya, and Uganda*. East Africa Multi – Disciplinary Advisory Team (EAMAT). ILO Publications, Geneva.
- Ishengoma, E. (2004). *The Role of Firm-Resources: Performance Differentials between Women- and Men-Owned Micro-Enterprises in Tanzania*. University of Leipzig
- Ishengoma, E. and Kappel, R. (2008). *Business Constraints and Growth Potential of Micro and Small Manufacturing Enterprises in Uganda*, German Institute of Global and area Studies, Hamburg, Germany

- Jain, R. Duin, and J. Mao. (2000). Pattern Recognition in higher Dimensional Space: A Review, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 22, no. 1, pp. 4-37
- Jovanovic, Boyan. (1982). Selection and the Evolution of Industry. *Econometrica* 50, no. 3: 649–70.
- Johnson, Peter; Cheryl Conway; and Paul Kattuman. (1999). Small Business Growth in the Short Run. *Small Business Economics* 12, no. 2: 103–12.
- Kaiser, H. F. (1960). The Application of Electronic Computers to Factor Analysis. *Educational and Psychological Measurement*, 20, 141-151.
- Kimuyu, P. (2004). Transformation of Small Firms and its Productivity Implication: Insights from Small Manufacturers in Kenya, Nairobi: University of Nairobi Working Paper, Economics Department and Institute for Development Studies.
- Liedholm, C., and Mead, C. Donald. (1999). Small Enterprises and Economic Development: The Dynamics of Micro and Small Enterprises, Rutledge Studies in Development Economics, New York.
- Lyne M. C. (2003). *Personal Communication*. Professor, Discipline of Agricultural Economics, University of KwaZulu-Natal, Pietermaritzburg, South Africa.
- Maddala, G. S. (1997). *Introduction to Econometrics: 2nd ed.*, 1997 Business Economics University of Florida and Ohio State University, MacMillan Publishing Company, New York.
- Manly, B. F. J. (1986). *Multivariate Statistical Methods: A Primer*. Chapman and Hall, London.
- Ministry of Trade and Industry. (MoTI). (1997). Micro and Small Enterprise Development Strategy of Ethiopia, Addis Ababa, Ethiopia, MoTI
- Sharma, S. (1996). *Applied Multivariate Techniques*, University of South Carolina, John Wiley and Sons, Inc, New York.
- Stranova, O. (2001). Determinants of Job Creation and Job Destruction in Ukraine. National University of Kirk Methyl Academy, Ukraine.
- USAID and CEU Labor Project. (2002). What Makes Small Firms Grow? A Study of Success Factors for Small and Micro Enterprise Development in Romania, Bucharest
- Wolday, A., and Gebrehiwot, A. (2004). Business Development Services (BDS) In Ethiopia: Status, Prospects, and Challenges in the Micro and Small Enterprise Sector. A Paper Presented in the International Conference on Micro finance Development in Ethiopia, 21-25 Jan 2004, Awassa, Ethiopia.
- Wright, R. E. (1995). Logistic Regression: Reading and understanding Multivariate Statistics, American Psychological Association, Washington Dc.

Appendix A

Table A.1: Description of potential constraints used in the model

Constraints	Description
Accbuscsl	Limited access to business counseling and advise
accinf	Lack of information access
acphinfr	Lack of access to physical infrastructure
acskltrn	Limited access to skill training
accsucap	Limited access to start up capital
accwrkap	Limited access to working capital
coltrl	Lack of collateral
complrgent	Unable to compete with large enterprises
insftdd	Inadequate demand for the product/service
instech	Insufficient technology
lgmsegov	Weak linkage between MSEs & government institutions
lgmslaent	Weak linkage between MSEs & large enterprises
lgmseprt	Weak linkage between MSEs & private institution
licregit	Bureaucracy in licensing and registration
opspselout	Inadequate operation space and selling outlet
rulreg	Too many and complex rules and regulations

Table A.2: Growth and performance of MSEs

Variables	Obs.*	Mean	Std. Dev.	Min.	Max.
Employment at start up (empsu)	224	8	5.86	1	28
Employment currently (empcur)	224	10	7.05	1	51
Capital at start up (capsu)	224	10,283.26	16656.95	100	120000
Capital currently (capcur)	224	27,221.63	54463.78	250	600000
Average monthly sales at start up (amsvsu)	224	2803.66	5068.12	50	45000
Average monthly sales currently (amsvcur)	224	5489.06	12404.60	50	150000
Capital-labor ratio at start up (klrsu)	224	1619.84	2517.58	6.4	17835
Capital labor ratio currently (klrcur)	224	3527.84	8147.68	33.3	100000

* Observation

Source: computed from own survey data, 2010

Table A.3: Growth measures of enterprises by size-group

Growth measures of enterprises	Size-group		Both size groups		
	Micro-enterprise	Small-enterprise	Mean	Min.	Max.
Annual Compound Growth Rates-ACGR (%)	0.13	0.09	0.11	-0.81	2
Annual Average Growth Rate in Employment-AAGRE (%)	0.16	0.14	0.15	-0.42	2
Annual Average Growth in Jobs-AAGJ	0.74	0.80	0.77	-5	11

Source: computed from own survey data, 2010

Table A.4: Eigenvalues of the components (comps)

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.37334	0.98698	0.2108	0.2108
Comp2	2.38635	1.00119	0.1491	0.3600
Comp3	1.38516	0.11468	0.0866	0.4466
Comp4	1.27047	0.04799	0.0794	0.5260
Comp5	1.22248	0.18803	0.0764	0.6024
Comp6	1.03444	0.25999	0.0647	0.6670
Comp7	0.77445	0.05020	0.0484	0.7154
Comp8	0.72424	0.07559	0.0453	0.7607
Comp9	0.64865	0.04090	0.0405	0.8012
Comp10	0.60775	0.02693	0.0380	0.8392
Comp11	0.58081	0.04646	0.0363	0.8755
Comp12	0.53434	0.06788	0.0334	0.9089
Comp13	0.46646	0.06468	0.0292	0.9381
Comp14	0.40177	0.05774	0.0251	0.9632
Comp15	0.34403	0.09882	0.0215	0.9847
Comp16	0.24521		0.0153	1.0000

Source: computed from own survey data, 2010

Reliability coefficients for each PCs and composite of PCs

Table A.5a: Reliability coefficients for each of PCs

No.	PCs	No. of items	Cronbach α coefficients
1	Limited access to premises	2	0.6529
2	Limited access to finance	3	0.6186
3	Limited access to business services	3	0.7241
4	Limited access to market	2	0.6727
5	Unfavourable government policy	2	0.6196
6	Weak institutional linkage	3	0.8351

Table A.5b: Reliability coefficients for the composite of PCs

Composite cronbach α coefficient	No. of items
0.7841	16

Impacts of Smallholder Tree Plantation in Amhara Region of Ethiopia: The Case of Lay Gayint and Fagta Locuma Districts¹

Fentahun Addis², Surafel Melak³, Berihun Tefera⁴ and Habtemariam Kassa⁵

Abstract

This study analyzes the impacts of smallholder plantation on the households' total cash income, modern agricultural input use, education and health care spending of 300 sampled households in Lay Gayint and Fagta Locuma district's of the Amhara Region, Ethiopia. A propensity score matching (PSM) analytical model has been used to examine the impacts of smallholder plantation on total cash income, improved agricultural input use, educational and health care expenditure. The PSM tool confirmed that, participation in to tree plantation had a significant impact on farm households total cash income, education and health expenditure outcome. However, it does not have a significant impact on the use of modern agricultural inputs. The findings of this study calls for the scale up of best practices of smallholder plantation in Amhara region and in Ethiopia at large. In addition, concerns have to be given in improving land productivity, educational level of farm households, and increasing market access and linkages, value addition of plantation products, expansion of infrastructures especially road and telecommunication networks in the rural parts to raise participation in plantation.

Key words: plantation, propensity score matching, planter, non-planter, impact analysis

JEL Classification: Q23, C99, DO2, C91, C18

¹ We thank the Center for International Forestry Research (CIFOR) for financing this research project. The helpful comments and suggestions of two anonymous referees are gratefully acknowledged. Any remaining errors are ours.

² Lecturer, Department of Economics, Bahir Dar University; **Corresponding Author.** Email fentahunaddis@gmail.com, Phone: +251 934248123

³ Assistant Professor, Department of Economics, Bahir Dar University; Email: msur69@gmail.com

⁴ Assistant Professor Department of Agricultural Economics, Bahir Dar University; Email: berihunt2@gmail.com

⁵ PhD, CIFOR- Ethiopia, Addis Ababa, Ethiopia; Email: habtekassa@yahoo.com

1. Introduction

Forests have an important role to play in alleviating poverty worldwide in two senses. First, they serve as a vital safety net function, helping rural people avoid poverty, or helping those who are poor to mitigate their plight. Second, forests have untapped potential to actually lift some rural people out of poverty (Sunderlin *et al.*, 2004). However, the actual and potential contribution of forests and trees to food security and sustainable livelihoods tends to be overlooked by decision and policy makers. The reason is due to a predominance of information on crops and livestock in the agriculture sector and/or a narrow vision on the role of forestry sector (FAO, n.d). This implies that, the contribution of forests to poor households is largely unrecorded in national statistics, most of it being for subsistence or for trade in local markets. In addition, the lion's share of wealth from timber goes to better-off segments of the society while some aspects of timber resources actually inhibit their potential to assist marginalized people.

Farm forest plantation has now been seen by many households as socially acceptable due to its ability to ensure the sustainability of the resource base and improve their socio economic wellbeing. Small scale forest plantations provide a range of benefits to rural communities, including fuel wood, fodder and wood for building and daily uses, as well as environmental and amenity benefits (FRA, 2010; Nawir *et al.*, 2007). Yet small scale producers and poor households still reap only a small portion of the commercial benefits from plantation derived wood and processed wood products, even though plantations in developing countries produce billions of dollars' worth of these products annually. There has been also a consistent bias against smallholder forestry in most developing countries with regard to technical support, market structure and government policies (Byron, 2001).

In Ethiopia, forest resources play a vital role in income generation especially for the poorest population. However, the economic contribution of forest resources to the national development of Ethiopia as well as to household livelihood is not adequately captured. A variety of forest products and services that constitute a major source of livelihood for rural households are not

formally traded or not monetary valued. Therefore, forestry's contribution is underestimated to the national economy (EPA, 2007).

Ethiopia has a long history of tree planting activities. According to historical records, afforestation started in the early 1400s by the order of King Zera-Yakob (1434-1468). Modern tree planting using introduced tree species (mainly Australian *Eucalyptus*) started in 1895 when Emperor Menelik II (1888-1892) looked into solutions for alleviating shortage of firewood and construction wood in the capital city, Addis Ababa (Nawir *et al.*, 2007). Forest plantation practices in Ethiopia are mainly of exotic tree species with *Eucalyptus* covering the largest area of hardwood plantations (EPA, 2007).

Amhara region has wide biodiversity composition of flora and fauna species (BoA, 2012). Plantation forests are mainly found in Awi, North Shewa, South Gonder, South Wollo, East and West Gojam zones of the region. These plantation forests are ranging from large scale to woodlots and homesteads. *Eucalyptus species*, *Acacia decurrens* and *Cupressus lusitanica* are the most common tree species widely planted in community woodlots and private tree investments in Amhara region.

Studies have been done on smallholder plantation in Ethiopia and Amhara region especially on *eucalyptus* plantation. Such studies were mainly focused more on the environmental and hydrological effects and impacts of *eucalyptus* and on value chain analysis (Example: Sirawdink *et al.*, 2011; Tilashwork *et al.*, 2013). However, there is no empirical evidence on whether or not participation in plantation improves the livelihoods of the participant households; that is, there is no study that has been done to examine the socioeconomic impacts of smallholder plantation in the study area. Hence, this study attempts to provide empirical evidence on the impact of smallholder plantation (*Acacia decurrens* and *Eucalyptus*) on household cash income, improved agricultural input use, education and health care service in the study districts.

The overall objective of this study is to examine the socioeconomic impacts of smallholder plantation forests in the study area. Specifically it evaluates the impact of smallholder plantation on:

- The economic benefits (total cash income and use of improved agricultural input) of the participant households.
- The social wellbeing (education and healthcare services) of the participant households.

2. The Conceptual Framework

2.1 Impact Evaluation Approaches

The main confront of an impact evaluation is to determine what would have happened to the beneficiaries if the program had not existed (Khandker, Koolwal, and Samad, 2010). A beneficiary's outcome in the absence of the intervention would be its *counterfactual*. However, the counterfactual is not observed. So the challenge is to create a convincing and reasonable comparison group for beneficiaries in light of this missing data. Ideally, one would like to compare how the same household or individual would have fared with and without an intervention or "treatment." But one cannot do so because at a given point in time a household or an individual cannot have two simultaneous existences. Therefore, finding an appropriate counterfactual is the main concerns of an impact evaluation. There are two methods to solve this problem: experimental and non-experimental approaches (Diaz and Handa, 2004).

2.1.1 The Experimental Approach

Experimental designs, also known as randomization, are generally considered the most robust of the evaluation methodologies. By randomly allocating the intervention among eligible beneficiaries, the assignment process itself creates comparable treatment and control groups that are statistically equivalent to one another, given appropriate sample sizes (Baker, 2000). If the assignment is properly carried out, random assignment creates a control group comprising individuals with identical distributions of observable and unobservable characteristics to those in the treatment group (within sampling variation). Hence, the selection problem is overcome because participation is randomly determined (Bryson, Dorsett, and Purdon, 2002).

2.1.2 Non experimental (Quasi-experimental) Approach

Non-random methods can be used to carry out an evaluation when it is not possible to construct treatment and comparison groups through experimental design. These techniques generate comparison groups that resemble the treatment group, at least in observed characteristics, through econometric methodologies, which includes propensity score matching, double difference methods, instrumental variables methods, and reflexive comparisons (Baker, 2000). These techniques require imposing assumptions which are non-testable, although many of their implications might be, and may or may not be tenable in actual data (Diaz and Handa, 2004). The choice of best approach is determined in large part by practicalities. Specifically, the characteristics of the program and the nature and quality of available data are key factors (Bryson *et al.*, 2002).

2.1.2.1 Propensity Score Matching Analysis

Propensity score matching analysis is a relatively recent statistical innovation that is useful in the analysis of data from quasi-experiments (Luellen, Shadish and Clark, 2005). The notion in propensity score matching is to develop a counterfactual that is as similar to the treatment group as possible in terms of *observed* characteristics. Each participant is matched with an observationally similar nonparticipant, and then the average difference in outcomes across the two groups is compared to get the program treatment effect (Khandker *et al.*, 2010). This method is very appealing to evaluators with time constraints and working without the benefit of baseline data given that it can be used with a single cross section of data (Baker, 2000).

Propensity score matching method have many advantages over other methodologies. First, it does not necessarily require a baseline or panel survey (Khandker *et al.*, 2010). Second, it allows matching subjects on a single number, no matter how many covariates are existed (Luellen *et al.*, 2005). Third, it avoids the ethical considerations which arise when a potentially beneficial treatment is denied to those randomly assigned out. Fourth, data generation may be less costly than in the case of an experiment since the latter

involves substantial monitoring to secure the random allocation (Bryson *et al.*, 2002).

This study adopts propensity score matching (PSM) technique, which is generally considered as a second best alternative to experimental design for such setting where there is no baseline or panel survey (Khandker *et al.*, 2010). There are steps to undertake propensity score matching analysis.

The first step under this methodology is estimation of propensity scores. Binary logistic regression is appropriate for estimating propensity scores, when the observed outcome for a dependent variable can have only two possible values (Gujarati, 2004; Luellen *et al.*, 2005).

The imposition of the common support is the second assignment in this methodology. There are two formal guidelines which are used to determine the region of common support (Caliendo and Kopeinig, 2005). Comparing the minima and maxima of the propensity score in both groups is the first method. This method is based on the notion that deleting observations whose propensity score is smaller than the minimum and greater than the maximum value in the opposite group. After the overlap region has been identified, observations whose propensity score fall outside this region will be rejected and for these individuals the treatment effect cannot be estimated. The second way is based on estimating the density distribution in both groups.

In evaluation literatures, there are mainly three different criteria's used for checking out the matching quality and choosing the best matching algorithm which is suited for the available data for analysis (Caliendo and Kopeinig, 2005; Stuart, 2010). These are equal means test; low pseudo-R² value and large matched sample size are the commonly used criteria's. Matching algorithm which provides insignificant means difference among all explanatory variables after matching between treated and control groups, low pseudo-R² value, and large matched sample is chosen as the best matching estimator.

Once the best matching algorithm is selected, checking whether the propensity score adequately balances characteristics between the treatment and

comparison group units is the following task. There are three alternative tests which can be used to prove the matching quality. These are standardized bias test, t test, Joint significance and Pseudo- R^2 tests (Heinrich *et al.*, 2010). The basic idea of all approaches is to compare the situation before and after matching and check if there remain any differences after conditioning on the propensity score (Caliendo and Kopeinig, 2005). If there are differences, matching on the score was not successful and remedial measures have to be done.

Subsequent to undertaking the above tests to check the validity of PSM, estimating the treatment impact of plantation program is the succeeding assignment. For a binary treatment, let D_i is program participation and let $D_i = 1$ for those who receive treatment (participate in to plantation) and $D_i = 0$ for those who do not receive treatment (not participate in to plantation). Then, the impact of a treatment on individual i , is the difference between the potential outcomes with and without treatment:

$$\tau_i = Y_1 - Y_0$$

Where, τ_i is treatment effect (effects due to participation in plantation), Y_1 is outcomes of participant household and Y_0 is outcomes of non participant household.

To evaluate the impact of a program over the population, it is possible to compute the average treatment effect (ATE) as:

$$ATE = E[\tau_i] = E(Y_1 - Y_0)$$

The parameter that received the most attention in evaluation literature is the average treatment effect on the treated (ATT) (Caliendo and Kopeinig, 2005; Diaz and Handa, 2004; Baum, 2013), which is defined as:

$$\begin{aligned} ATT &= E(\tau_i / D = 1) = E[(Y_1 - Y_0) / D = 1] \\ &= E(Y_1 / D = 1) - E(Y_0 / D = 1) \end{aligned}$$

Where $E(Y_1/D=1)$ is the average outcome of those households who participated in plantation and $E(Y_0/D=1)$ is the average outcome of those households if they were not participated in plantation program.

However, $E(Y_0/D=1)$ is unobserved and is the counterfactual of interest: what the outcome for treated units would have been had they not received treatment; however, this counterfactual is not observable in the data. What we can observe instead is the average outcome in the untreated state $E(Y_0/D=0)$ ⁶, which could serve as an estimate for the counterfactual and ATT can be computed as,

$$ATT = E(Y_1/D = 1) - E(Y_0/D = 0)$$

The difference between the counterfactual for treated units and observed outcomes for untreated units is called selection bias term (Baum, 2013). That is,

$$E[Y_0/D = 1] - E[Y_0/D = 0] = \text{selection bias (SB)}.$$

The true parameter *ATT* is only identified, if selection bias is zero (SB=0); that is;

$$SB = E[Y_0/D = 1] - E[Y_0/D = 0] = 0$$

Conducting of sensitivity analysis is the final procedure in PSM. The matching only control for the differences on the observed variables and there may be some bias resulting from unobserved covariates that could affect whether subjects receive treatment or not (Luellen *et al.*, 2005). If there are unobserved variables which affect assignment into treatment and the outcome variable simultaneously, a hidden bias might arise to which matching estimators are not robust (Becker and Caliendo, 2007). The concern here is, whether or not inference about treatment effects may be altered by unobserved factors.

⁶ In our case, $E(Y_0/D=0)$ is the average outcome of those households who didn't participated in plantation (households who don't have planted tees).

3. Methodology

3.1 The Study Area

Lay Gayint district is found in South Gondar zone of Amhara National Regional State. It is found 75 km away from the zonal capital Debre Tabor, and about 175 km from Bahir Dar, along with the main road from Bahir Dar to Woldia. Geographically, the district is located between 11⁰ 32'-12⁰ 16' north latitude and 38⁰ 12'-38⁰ 19' east longitude. Altitude of Lay Gayint ranges from 1 500 to 4 231 meters above sea level. The mean annual temperature in the district is between 8⁰ C and 20⁰ C, while average annual rainfall ranges from 660 mms to 1 200 mms (Lay Gayint District Agricultural Office, 2013). Crop production, livestock and forest products mainly from plantation are the principal sources of livelihood for farmers. The district has a great potential for forest plantation. Especially, *Eucalyptus globules* and *Cupresses lustanica* tree species are widely planted in this district.

Fagta Locuma district has a total land cover of 67 733.32 hectares and it is one of the eighth district's of Awi zone; Amhara region. It has about 25 rural and 2 urban kebeles. Agriculture and tree plantation are the basis of the livelihood of the district. Recently, the district has become known in its *Acacia diculture* plantation. The latitude of the district ranges from 1,800 to 2,950 metres above sea level while the average rain fall and temperature of the area is 2 371 mm and 20⁰ C respectively (Fagta Locuma District OoFED, 2014).

3.2 Sampling Techniques

A multistage sampling technique was used to select sample households. In the first stage, two districts namely; Lay Gayint and Fagta Locuma were purposely selected because of their best smallholder plantation experience and plantation species differences. *Eucalyptus globules* and *Acacia diculture* plantation experience are widely found in Lay Gayint and Fagta Locuma districts respectively. In the second stage, in consultation with district level experts from each district, two sampled kebeles (a total of four kebeles) were purposely selected for their considerable plantation forestry practices. In the third stage, households in the selected kebeles were stratified into planters

(program participants) and non-planters (program non participants). In the final stage, a total sample of 300 households (a sample of 150 households from each district) from which 153 participants (planters) and 147 non-participants (non participants) were randomly selected for the analysis.

3.3 Data

Both primary and secondary data were used. Primary data on the socio economic characteristics, farm characteristics, and demographic characteristics, resource ownerships of the households, tree plantation practices, hypothesized impact indicators and other variables which are relevant for the study were collected using a pre-tested structured questionnaire through household survey. Secondary data on the price of each crop in the respective districts were collected from different institutions; the Trade and Transport Bureau of Amhara National Regional State; Trade and Transport Office, Finance and Economic Development Office and Agricultural Office of district's.

3.4 The Analytical Model

To estimate the multidimensional impacts of plantation, one must first calculate the propensity score $P(X)$ on the basis of all observed covariates X that jointly affect participation in plantation and the outcome of interest (Khandker *et al.*, 2010). Propensity score typically computed using logistic regression (Caliendo and Kopeinig, 2005; Luellen *et al.*, 2005; Domingue and Briggs, 2009). The study assumed that participation in plantation is program intervention and households who have planted trees were considered to be a treated group and households who don't have planted trees were the controlled group. Therefore, PSM was used to compare the level of economic and social impacts of planters to that of non-planters.

Accordingly, the logit model for participation in plantation program is specified as follows.

$$Pr(\textit{participation}) = f(X_i)$$

Where Pr (*participation*) is the probability of participation in plantation (both in *Eucalyptus* and *Acacia decurrens*); $f(X_i)$ is dependent variable of the model; household's participation in plantation forest. It takes value 1 if the household is participated in plantation and takes 0 otherwise. Households' having planted trees with area cover of 0.125 hectare and above were considered as planters whereas households who never planted trees or have planted trees with area cover below 0.125 hectare of land were considered as non planters. X_i 's are multidimensional vector of covariates affecting the probability of participation in plantation.

$$X = (\text{sex}, \text{age}, \text{fmly_size}, \text{educ}, \text{land_size}, \text{land_prod}, \text{livestock}, \text{ex_service}, \text{mkt_distc}, \text{nursery})$$

Where;

- sex* = sex of the household head (1= male and 0= otherwise)
- age* = age of the household head in years.
- fmly_size* = the number of individual members in a given household.
- educ* = a dummy variable used to measure the educational status of the household head (1= literate and 0= illiterate)
- land_size* = the amount of land holding in hectares.
- land_prod* = a proxy variable used to measure the productivity of agricultural land (main crop produced in the study area) of the household measured in monetary value per hectare per year.
- livestock* = the total number of livestock holding measured in tropical livestock unit.
- ex_service* = the number of days per year in which agricultural extension workers visit a given household farming practice for the provision of extension service.
- mkt_distc* = the distance measured in kilometre from household's village to the nearest market centre at which farmers sell plantation product (sell at the farm get price).
- nursery* = a dummy variable for ownership of nursery by a household and takes value 1 if a household has a nursery site and 0 otherwise.

The impact indicator variables used to assess the impact of tree plantation on participant households in this study includes:

Household income (cash income): It is the amount of annual household cash income which is generated from different income generating activities (from crop sale, livestock and the sale of their product, sale of forest and plantation trees, and income from other off farm activities etc).

Improved agricultural input use: It is the adoption of improved agricultural inputs by households in farm practice. It is the amount of annual household's spending in birr for the purchase of improved agricultural input (for fertilizers, improved seeds, pesticides, insecticides, adoption of improved animal species etc). Participation in plantation is expected to increase the incomes of households.

Education spending: This is the annual amount of birr spent for educating household members who are currently enrolled in education.

Expenditure on health care service: This is the annual health care spending of household for their family members measured in terms of birr.

4. Results and Discussion

4.1 Descriptive Statistics Results

Table 4.1 shows that statistically there is a significant difference between planters and non-planters in terms of family size, land holding in hectare, livestock holdings, extension service provision and distance to the nearest market centre. Family size and extension services are significant at 5% and 10% probability levels respectively while land holding in hectare, market distance and livestock holdings are significant at 1% probability level. In contrast to the non-planter households, planter households have large family size, larger land holding, livestock holding, being visited more frequently by development agents and short distance to the nearest market centre.

Table 4.1: Summary Statistics and Mean Difference Test on Continuous Covariate Variables

Variables	Unit	Planters (N=153)		Non-planters (N=147)		Total (N=300)		Mean Difference		T value
		Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	
age	Year	50.85	13.75	49.67	14.59	50.27	14.16	1.18	1.64	0.719
family size	No	5.74	1.99	5.27	2.09	5.51	2.05	0.45	0.24	1.976**
land size	ha	1.53	0.76	1.004	0.69	1.27	0.77	0.53	0.84	6.245*
livestock	TLU	5.17	3.37	3.93	2.61	4.56	3.08	1.23	0.35	3.53*
extension service	Day	28.07	23.87	23.46	23.65	25.81	23.83	4.62	2.74	1.68***
market distance	Km	3.94	2.60	4.90	3.39	4.41	3.05	-0.97	0.35	-2.783*
land productivity	Birr	8013.2	10869.4	6590.3	6597.5	7316	9045.5	1423	1043.9	1.364

Remark: *, ** and *** significant at 1%, 5% and 10% significance levels respectively.

Source: Survey result

The output tabulated in Table 4.2 also revealed that, there is a statistically significant difference between planters and non-planters in total cash income, spending on the access to modern agricultural inputs, education and health care services. Planters on average obtain total cash income of birr 27.45 thousands which is 206.7 percent higher than the total cash income of non-planter households and this result is significant at 1% probability level. Similarly, on average planter households spend 86.2 percent and 53 percent more money for education and the purchase of modern agricultural inputs as compared to non-planter households and significant at 1% and 10% probability levels respectively. Hence it is possible to signify that, non-planter households spend birr 0.61 thousands on average more than that of the planter households for healthcare and this result is significant at 5 % probability level.

In cognizant, on average, at 1% probability level planter households approximately educate one more (0.001 thousand) family member (kid) than

non-planter households. Moreover, planter households spend birr 0.32 thousands more per head (kid) per annum for education compared to non-planter households.

Table 4.2: Summary Statistics and Mean Difference Test of Outcome Variables (in thousands)

Variables	Planters (N=153)		Non-planters (N=147)		Total (N=300)		Mean difference		T value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Total income	27.45	49.25	8.95	19.02	18.38	38.67	18.5	4.35	4.25*
Crop income	1.39	2.3	0.69	1.27	1.05	1.90	0.7	0.22	3.18*
Livestock income	3.46	7.93	4.07	16.86	3.76	17.07	-0.61	1.51	-0.41
Plantation income	18.02	47.39	1.45	5.83	9.9	35.03	16.57	3.94	4.21*
Off_ income	4.59	10.72	2.75	6.43	3.68	8.91	1.84	1.02	1.8***
Input spending	2.05	3.75	1.34	2.5	1.7	3.22	0.71	0.37	1.92***
Education enrolment	0.003	0.002	0.002	0.0013	0.0023	0.0014	0.001	0.0002	5.0*
Education spending	2.42	3.46	1.3	1.99	1.87	2.89	1.12	0.33	3.4*
Spending per kid	0.97	1.45	0.65	0.79	0.82	1.2	0.32	0.15	2.13**
Health spending	0.81	1.39	1.42	3.38	1.11	2.58	-0.61	0.3	-2.1**

Remark: *, ** and *** implies significant at 1%, 5% and 10% significance levels respectively.

Source: Survey result

4.2 The Logit Outcome

Prior to econometric estimation, different econometric assumptions were tested using appropriate techniques to check the reliability and consistency of the collected data. The presences of strong collinearity among explanatory variables were tested using variance inflation factor and contingency coefficients for continuous and discrete explanatory variables respectively.

Thus, the test results confirmed that, there are no serious multicollinearity problems among explanatory variables. Similarly, presence of heteroscedasticity problem was tested by Breusch-Pagan test and the result proved that there is no problem of heteroscedasticity.

4.2.1 Propensity Scores

Binary logistic regression model was used to estimate propensity scores for matching treated households with control households. For estimating propensity scores only those variables which affect both the likelihood of plantation and the outcomes of interest were included. The estimated regression results (see Table 4.3) shows that the probability of participation in plantation is significantly and positively affected by nursery ownership, land holding size, land productivity, and household head education and these results are significant at 1%, 1% 5 % and 5% probability level respectively. On the other hand, the probability of participation in plantation is negatively affected by distance to the nearest market centre which is significant at 1% probability level. A strong and positive relation between nursery ownership and participation in plantation might be due to the fact that, having nursery reduces the investment funds, which is potentially limited for smallholders, incurred to purchase seedling, and hence increases the likelihood of planting trees. Households who have large land holding have the likelihood of planting trees. The reason as to why this might be the case is that in plantation, investments and returns occur in different time horizons, so that net return maximization is an inter-temporal problem. Smallholders continuously discount the expected costs and returns. Therefore, having large land holding may help households to allocate parts of it for crop production, animal grazing and the remaining for planting trees. This result is consistent with the finding obtained in Sodo Zuria district, southern Ethiopian (Bliss and Zeleke, 2010) and in New Zealand (Dhakal *et al*, 2008).

Likewise, land productivity strongly affects plantation participation. This implies that households who own productive land have higher probability of planting trees (mainly due to high market demand for plantation products) than households whose land is less productive. This finding is also in line with the study made by Bliss and Zeleke (2010) in Sodo Zuria district, southern

Ethiopia. In terms of the educational status of head of the household, households having literate head are more likely to plant trees than their illiterate counterparts. The possible explanation for this might be because literate households better know the environmental and economic benefits of planting trees and plantation management techniques than the illiterate ones. Education level is also found to have positive correlation with tree plantation in Sri Lanka (Karunaratna and Gunatilake, 2002).

Table 4.3: Logistic Regression Results for Plantation Participation

Variables	Coefficients	dy/dx (Marginal effects) ^a	Z_value
_cons	-1.55	-	-2.00
Sex	-0.67	-0.162	-1.17
Extension service	0.003	0.0004	0.22
Livestock	.03	0.006	0.38
age	-0.0024	-0.0008	-0.28
Family size	0.009	0.0032	0.12
Nursery ownership	1.38	0.332	4.96*
Land size	1.17	0.292	4.26*
Market distance	-0.16	-0.038	-2.99*
Land productivity	0.00005	0.00002	2.34**
Education	0.59	0.1455	1.98**
Number of obs =	300		
LR chi ² (10) =	91.02		
Prob > chi ² =	0.0000		
Log likelihood =	-162.37663		
Pseudo R ² =	0.2189		
% correctly predicted =	80%		

Remark: *, and ** indicates significant at 1% and 5% significance levels, respectively.

a dy/dx is for discrete change of dummy variable from 0 to 1

Source: Estimation result

Since market inaccessibility restricts opportunities for income-generation (IFAD, 2003), there is also an inverse relationship between the planting decision and the distance to the nearest market centre. As a result, those households who are living near to the market centre are more likely to plant trees than households who are far apart from the market centre. This might

be because nearest to the market households are likely to incur lower transaction and transport costs, have better access to information and extension services than the distant households.

4.2.2 Common Support Region

After estimation of propensity score, determination of the common support region is the next assignment. The common support is determined by using the comparison of the minima and maxima of the propensity scores. The common support region (Table 4.4) lies between 0.0800483 and 0.9891113. This implies that, out of the total 300 observations, ten observations were deleted from the analysis and not used to estimate the treatment impact.

Table 4.4: Distribution of Estimated Propensity Scores

Groups	Obs.	Mean	Sta. dev.	Min	Max	Omitted obs.
All sampled households	300	.51	.2610326	.0249842	.9899327	10
Planter households	153	.6459373	.2218888	.0800483	.9899327	1
Non-planter households	147	.3685143	.2208271	.0249842	.9891113	9

Source: Estimation result

4.2.3 Matching Algorithm

Three different criteria; equal means test; low pseudo-R² value and large matched sample size were used to prove the matching quality and choosing the best matching algorithm. In line with this, kernel matching with band width 0.1 fits all the three criteria and hence the best matching estimators for this study. Thus, results are given based on kernel matching algorithm with 0.1 band width.

4.2.4 Testing the Balance of Propensity Score and Covariates

Standardized bias, t-test, Joint significance and Pseudo- R^2 are used to check the matching quality. With regards to these tests, the result shows that after matching, the distributions of covariates have no significant differences for both planter and non-planter households and it is trustworthy to estimate treatment effect based on the available data set.

4.2.5 The Impacts of Smallholder Plantation

The main goal of propensity score analysis is to balance two non-equivalent groups; treated and control groups, on observed covariates to get more accurate estimates of the effects of a treatment (average treatment effect on the treated) on which the two groups differ (Luellen *et al.*, 2005). In line with this, the result from the propensity score matching estimation (Table 4.5) shows that there is significant difference in total cash income between planter and non-planter households and this result is significant at 1% probability level. It has been found that, on average, planter households have an income of birr 27.6 thousands, which is by 141.68 percent higher than the total cash incomes of non-planter households. This leads to a viable proposition that households participated in plantation set a prior aim of generating cash income.

Also, there is a statistically significant difference between planters and non-planters on education spending for household members who are currently enrolled in education (Table 4.5). Planter households spend 69.45 percent more birr for educating their household member than their counter parts. This might be because, first, as compared to the other agricultural activities plantation demands less labour force and hence school aged household members may attend education and educational spending rises in line with the number of enrolment. Second, plantation product is more liquid and divisible asset than another asset and hence enables households to easily access finances required for education and other related costs. Third, having high income is positively associated with education (Blanden, Gregg and Machin, 2002).

With regard to healthcare spending, there is a significant difference between planter and non-planter households and this difference is significant at 10% probability level. Looking into the health care spending, on average non-planter households spend about birr 0.92 thousands more than the planter households. The reason might be due to the fact that planter households have generated more income especially from plantation and this opportunity enables them to consume a balanced and diversified diet, to buy more sanitary materials and cloth than to that of the their counter parts and hence reduces health care spending. Poor diets and poor nutrition can lead to a number of different and very serious health problems (FAO, n.d). Balanced diets and good eating habits are fundamental for proper growth and development and for the prevention of disease. It helps to prevent from debilitating health problems caused by poor nutrition.

Table 4.5: Impacts of Plantation Forest on Households (per annum)

Outcome Variables in thousands	Treated	Controls	Difference	S.E^B	T value
Total cash income	27.6	11.42	16.18	4.31	3.75*
Educational spending	2.44	1.44	1.00	0.38	2.63**
Health care spending	0.82	1.74	-0.92	0.50	-1.84***
Agricultural input spending	2.051	1.664	0.39	0.40	0.975

Remark: *, ** and *** implies significant at 1%, 5% and 10% significance levels, respectively.

^B Stands for bootstrapped standard error which is obtained after 100 replication.

Source: Estimation result

Modern agricultural input use which is measured in terms of monetary spending on the purchase of such inputs (for example fertilizer, improved seeds, insecticides, insecticides and so forth) is the last outcome indicator variables of plantation participation. As it is shown in Table 4.5, there is insignificant difference between planters and non-planters in terms of modern agricultural input use. The possible reasons might be; first planters are shifting some proportions of their land for planting trees; which does not require the use of modern agricultural inputs and hence spending on such inputs was low. Second, planter households may spend more of their plantation income for consumption purpose especially on manufactured consumer goods, which are

highly income elastic and the purchase of other asset bearing activities like livestock, house construction and the like.

4.2.6 Sensitivity Analysis

Sensitivity analysis helps to check the estimated results based on matching are robust to the possible presence of unobserved confounders (Keele, 2010). The Rosenbaum bounding approach of sensitivity analysis was used to assess how robust the findings are to hidden bias due to an unobserved confounder in this study. The sensitivity analysis result shows even though two groups (planters and non-planters) with the same observed covariates (after matching) may differ in their odds of receiving the treatment by a sensitivity parameter up to $\Gamma=6$, the inferences on the impacts of smallholder plantation on the households total cash income, educational and health care spending results are insensitive to unmeasured covariates.

5. Conclusion and Policy Implication

5.1 Conclusion

This study examined the impacts of smallholder plantation on the households' total cash income, modern agricultural input use, educational and health care spending in Fagta Locuma and Lay Gayint districts of the Amhara National Regional State, in Ethiopia. Cross sectional data sets using structured questionnaires were drawn from a sample of 153 planter and 147 non-planter households.

Findings have shown that there is a statistically significant difference between planters and non-planters in terms of total cash income, education and health spending and modern agricultural input uses. Planter households have higher total cash income, educational spending and modern agricultural input use than non-planter households. In contrast, non-planters have higher health care spending than the planters.

The propensity score matching estimation result shows that, there is a significant difference between planters and non-planters in terms of the outcome variables; total cash income, education spending and health care

spending. The effect of plantation on households total cash income revealed that, on average planter households generated a cash income of birr 27.57 thousands, which is by 141.68 percent higher than the total cash incomes of non planter households. Moreover, for education purpose, on average planter households spend 69.85 percent more birr than the non-planter households. In addition, non-planter households spend 918 more birr over the planter households for health care service. In contrast, smallholder plantation has not brought significant effect on the planters in terms of modern agricultural input use in the study area under consideration.

5.2 Policy Implication

Evaluating the impacts of smallholder plantation has a paramount importance to scale up plantation practices by prioritizing certain areas of intervention in the sector through designing policies, programs and projects. Thus, the following recommendations are drawn for better development of smallholder plantation.

- The likelihood of plantation participation is significantly and positively affected by land productivity. Applying certain sustainable land management practices such as soil bounds, stone bounds, check dams and so forth; fertility improvement practices such as application of chemical and natural fertilizer (ex. manure) and agronomic practices such as crop rotation and fallowing has a great role for improving the productivity of land. Thus, attention has to be given to intensify such practices.
- The educational status of the household head is also another significant factor which affects plantation participation. Therefore, better attentions have to be given to educate farmers (to increase the awareness of farm households). Especially, more focuses have to be given for farmers training, functional adult literacy and vocational education and trainings.
- Nursery ownership has also positive impact on plantation participation. Poor seedlings are likely to have slower growth, to be less able to compete with weeds, and to be more liable to damage by insects and pests. Further, in a poor nursery, fewer seedlings will be raised from a given quantity of seed, and there will be considerable waste of money and time. Thus,

owning nursery (nurseries) helps in matching demand with production of planting materials and controlling its quality, to reduce the financial money spend for purchasing seedlings. Therefore, emphasis have to be given on the establishments of own nursery sites by households coupled with the provision of quality seeds and other required inputs.

- Better attentions have to be given to establish and expand market centres, infrastructure like road, telecommunication, and market information system near to smallholder farm households.
- Due attention is required to expand plantation practices as it is considered to be a key instrument to reduce rural poverty.
- Concerns also have to be given to organize farmers into cooperatives so as to increase the bargaining power of farmers in the market place to obtain good prices for their plantation products, developing new market channels for the products, enable cost-effective delivery of extension services and to access timely information for the member households.

References

- Amhara Region Bureau of Agriculture (BoA). (2012). "GIS based forest resource assessment, quantification and mapping in Amhara Region", Bahir Dar, Ethiopia.
- Baker, J. L. (2000). *Evaluating the Impact of Development Projects on Poverty: A Handbook for Practitioners*. The World Bank, Washington D.C.
- Baum, C. (2013). Propensity score matching, regression discontinuity, limited dependent variables, *Applied Econometrics*, Boston College.
- Becker, S. and Caliendo, M. (2007). "Mhbounds - sensitivity analysis for average treatment effects", IZA Discussion Paper, No. 2542, Bonn, Germany.
- Blanden, J., Gregg, P. and Machin, S. (2002). "*Education and Family Income*", London School of Economics.
- Bliss, J. and Zeleke, E. (2010). "Tree growing by smallholder farmers in Ethiopian highlands", in: Mirko, M. (eds.), *Small scale forestry in changing world: Opportunities and challenges and role of extension and technology transfer*, IUFRO conference, 06-12 June 2010, Bled, Slovenia.
- Bryson, A., Dorsett, R., & Purdon, S. (2002). The use of propensity score matching in the evaluation of active labor market policies: Policy studies institute and national centre for social research.
- Byron, N. (2001). "Key to Smallholder Forestry", *Forest, Trees and Livelihoods*, Vol.11, pp. 279-294.
- Caliendo., M. and Kopeinig, S. (2005). "Some practical guidance for the implementation of propensity score matching", Working Paper 485, German Institute for Economic Research, Berlin.
- Dhakal, B., Bigsby, H. and Cullen, R. (2008). "Determinants of forestry investment and extent of forestry expansion by smallholders in New Zealand", *Review of Applied Economics*, vol 4, 1-2, pp. 65-67.
- Diaz, J. and Handa, S. (2004). "An assessment of propensity score matching as a non experimental impact estimator: Evidence from a Mexican poverty program".
- Domingue, B. and Briggs, D. (2009). "Using linear regression and propensity score matching to estimate the effect of coaching on the SAT", University of Colorado, USA.
- Environment Protection Authority (EPA). (2007). "*Ethiopia Environment Outlook: Environment for Development*", Addis Ababa, Ethiopia.
- Fagta Locuma District Finance and Economic Development Office. (2014). "2013/2014 production season plan", Addis Kidam, Amhara Region, Ethiopia.
- FAO. (n.d). "Forests, trees and food security", Rome, Italy.

- FAO. (n.d). “Eating Well for Good Health”, <http://www.fao.org/docrep/017/i3261e/i3261e07.pdf> (accessed on 10 September 2015).
- FRA. (2010). “Socio-economic functions of forest resources”, FAO forestry paper, 163, Main Report.
- Gujarati. (2004). *Basic Econometrics*, Fourth edition, The McGraw–Hill companies.
- Heinrich, C., Maffioli A. and Vázquez, G. (2010). “A primer for applying propensity-score matching, Impact-evaluation guidelines”, Technical Notes No. IDB-TN-161.
- IFAD. (2003). “Promoting market access for the rural poor in order to achieve the Millennium Development Goals”, Roundtable discussion paper for the 25th anniversary session of IFAD’s governing council.
- Karunaratna, K. and Gunatilake, H. M. (2002). “Socio-economic factors affecting tree cultivation in Home gardens in Kandy and Kegalle districts”, *Tropical Agricultural Research* Vol. 14:292-303.
- Keele, L. (2010). “An overview of rbounds: An R package for Rosenbaum bounds sensitivity analysis with matched data”, <http://www.personal.psu.edu/ljk20/rbounds%20vignette.pdf> (accessed on 10 December 2015).
- Khandker, S., Koolwal, G., and Samad, H. (2010). *Handbook on Impact Evaluation: Quantitative Methods and Practices*, World Bank, Washington DC.
- Layi Gayint District Agricultural Office. (2013). “2014/2015 production season plan”, Nefas Mewcha, Amhara Region, Ethiopia.
- Luellen, J., Shadish, W. and Clark, M. (2005). “Propensity scores: An introduction and experimental test”, *Evaluation Review*, Vol. 29 No. 6, DOI: 10.1177/0193841X05275596
- Nawir, A. A., Kasha, H., Sidewall, M., Dore, D., Campbell, B., Olsson, B. and Bekele, M. (2007). “Stimulating smallholder tree planting lessons from Africa and Asia”, *Unasylva* 228, Vol. 58.
- Sirawdink, F., Zerihun, K., Amsalu, N., Nardos, Z. and Seife, B. (2011). “Allelopathic effects of *Eucalyptus camaldulensis* Dehnh: On germination and growth of tomato”, *American-Eurasian J. Agric. and Environ. Sci.*, 11 (5): 600-608, 2011. ISSN 1818-6769.
- Stuart, E. (2010). Matching methods for causal inference: A review and a look forward, *Statistical Science*, Vol. 25, No. 1, 1–21.
- Sunderlin, W., Angelsen, A. and Wunder, S. (2004). “Forests and poverty alleviation”, *Center for International Forestry Research Publication*.
- Tilashwork, C., Collick, S., Enyew, A., Lehmann, J. and Steenhuis, T. (2013). “Eco-hydrological impacts of *Eucalyptus* in the semi humid Ethiopian Highlands: the Lake Tana Plain”, *J. Hydrol. Hydromech*, 61, 2013, 1, 21–29, DOI: 10.2478/johh- 2013-0004.

Growth, Structure and Firm Dynamics in Grain Markets: The Case of Grain Traders in Ethiopia

**Tadele Ferede¹, Mulat Demeke², Wolday Amha³,
Kindie Getnet⁴**

Abstract

In this paper we consider the microeconomic evidence on the determinants of firm performance in Ethiopia, with a focus on grain traders. We analyse both internal and external factors, and the relative impacts of these factors on the performance of grain traders. Different economic indicators seem to suggest that grain traders have become increasingly unviable as reflected by absence or stagnation of growth. These firms suffer from a host of internal problems (e.g. weak human resources and other assets) and of external factors such as access to credit, market facilities, policy and regulatory framework, etc.). Hence without renewed focus on promoting firm growth, especially grain traders through improving access to warehouses, relaxing credit constraints, and improving the macroeconomic and regulatory environment, not only grain traders but also rural and urban households will face a very uncertain and untenable future which will hamper the performance of grain markets and the battle against poverty and food insecurity.

Key Words: Firm, growth, grain traders, Ethiopia

JEL Classification: D22, F14, L11, L20

¹ PhD, Department of Economics, Addis Ababa University

***Corresponding author:** Tadele Ferede; Email: tadeleferede@yahoo.com;

Tadele.Ferede@ua.ac.be;

² PhD, FAO, Rome, Email: mulat.demeke@fao.org

³ PhD, Association of Ethiopia Microfinance Association, Addis Ababa
woldayam@yahoo.com

⁴ PhD, International Water Management Institute, Addis Ababa
k.getnet@yahoo.com

1. Introduction

While inflationary pressures and trends might be responsible for the surge in price trends experienced in recent years, seasonality of supply and lack of temporal and spatial arbitrage are responsible for price variations observed in agricultural products in countries such as Ethiopia.

High and volatile prices are caused by a wide variety of supply and demand side factors (Demeke *et al.*, 2012). Demand is steadily increasing due to population growth, urbanization and rising income levels. In contrast to the steady increase in demand, supply appears to be characterized by uncertainty and variability. This is also influenced by the inefficiency of grain markets, which are dominated by small traders with limited storage and distribution capacity. Supply shortages often trigger panic buying and price escalation, which also increase the inflationary pressure. The problem is often made worse by policies that attempt to control private speculative storage. It is assumed that speculators disrupt grain marketing, overlooking their role in widely fluctuating supply with fairly stable demand. A transparent and predictable business environment for traders can reduce food price instability in Ethiopia and other African countries (Minot, 2010).

A wide range of structural and institutional factors has hindered private sector investment and growth in grain marketing activities. Only growing grain trading enterprises can contribute to sustainable expansion and transformation of the grain marketing sector. Employment and wealth can be generated through the creation and expansion of firms. With large size, firms are able to benefit from scale economies and become efficient and competitive. Firm growth is, therefore, a way to introduce innovations, increase competitiveness and ensure survival in the market. The central objectives of this study are two-fold: to study both internal and external factors affecting market improvement and development in Ethiopia; and to evaluate the relative impact of the different factors on growth of grain traders.

The paper is organized as follows. Following the introduction, Section 2 presents the analytical framework. Sections 3 and 4 deal with description of

data and sample characteristics and determinants of growth, respectively. Discussion of econometric results and conclusion are presented in Sections 4 and 5, respectively.

2. Analytic framework to understand factors affecting firm growth in grain trading

According to standard microeconomic theory of a perfectly competitive market, firms faced with a U-shaped average cost curve will grow until they reach the size corresponding to the lowest point on the curve. Firms have no incentive to grow beyond the point of lowest average cost; hence the size of perfectly competitive firms will be narrowly dispersed. Any significant deviation from the optimum size (lowest average cost) will be temporary and will diminish over time and firms converge towards the equilibrium size. Once established, small firms have to grow quickly until they reach the efficient scale. The U-shaped average cost curve reflects a manufacturing economy characterized by a high degree of division and specialization of labor and by large fixed capital that is spread out over increasing quantities of labour. As the process of competition forces the less efficient firms to exit, only the fittest survive. In practice, however, it is common to observe large dispersions of firm sizes within the same industry: a few very large firms may coexist with a large number of small firms in many industries. One possible reason is an L-shaped average cost curve which could mean widely varying firm sizes, all producing at the same average cost. Research on the growth of firm began with Gibrat's (1931) law of proportionate effect (LPE). Gibrat's law stipulates that the rate of growth of a firm is independent of its initial size. The size of the firm at a given point in time is rather a product of a series of random growth rates in the history of the firm. This stochastic growth model can generate right-skewed distributions (log-normal distribution), and the skewness increases as the value of the log standard deviation (σ) increases.

Several studies have tested Gibrat's law in the presence of other factors influencing firm growth. Owner-specific attributes such as education, work experience, gender, social network, ownership structure etc. influence firm growth. Different studies have examined how the different attributes affect

growth. According to Kantis *et al.* (2004), secondary school attainment, for instance, had no discernible impact on firm growth. On the other hand, the findings of many studies (Mead and Liedholm, 1998; Parker, 1995; McPherson, 1996) revealed that owners of firms completing secondary school had more rapidly growing firms in Kenya and Zimbabwe, but the same studies found no significant effect of primary education on firm expansion, particularly in medium and small enterprises. Many studies (e.g. Colombo and Grilli, 2005; Brown *et al.*, 2004; Mengistae, 2001; Jo and Lee, 1996; Roberts, 1991; Bates, 1985) also indicated that education, training, experience, etc., are key determinants of firm performance, while Cooper (1993) and Storey (1994) found no or even a negative relationship between work experience and firm growth.

Firm characteristics such as firm age is often identified as a major determinant of firm growth. Many studies in Africa, Latin America and developed countries (Mead and Liedholm, 1998; Parker, 1995; Variyam and Kraybill, 1992; Evas, 1987) revealed that younger firms are more likely to show higher rates of growth compared to firms that have been in existence longer. However, Heshmati (2001) reported that while younger firms experience faster employment growth, older firms experienced faster growth in the size of assets and volume of sales. Small and informal firms are relatively able to circumvent government regulations and taxation. However, as informal firms grow, there is a risk of becoming visible and creating disincentives to expand beyond a certain size (Snodgrass and Biggs, 1996). Thus, informality reduces chances for growth and it is associated with several other attributes that make growth difficult.

Investments in technology allow firms to produce more efficiently, supply the market with better products and get more opportunities to grow. Variyam and Kraybill (1994) found out that the majority of managers of firms analyzed considered the use of technology as a critical element in their comparative advantage. Those firms, which placed more emphasis in the use of new technology, had higher growth rates than firms that did not view technology as a critical factor.

Policy and regulatory environment facilitate or constrain firm size and growth. Regulatory measures strive to enhance competition among firms and, at the same time, to guarantee the quality and standardization of the product (Demeke and Ferede, 2005). Many studies (Beck *et al.*, 2005; Desai *et al.*, 2005; Johnson *et al.*, 2002; Rajan and Zingales, 1998), however, indicate that inadequate enforcement of property rights, legal constraints, and cumbersome regulations have adverse effects on firm growth and investment. De Soto (1987) argued that strict regulations and high taxes may keep firms small and informal. Regulation and institutional challenges may also deter firm owners from making growth-enabling investments while special subsidies and trade protection offer greater benefits to larger firms, which are often more capable of lobbying (Tybout, 2000). The inconsistency of policies and regulation increases uncertainty and risk which can destroy a flourishing firm and reduces the incentive to invest in grain marketing and processing. Firms may also postpone investment waiting for less uncertain future.

Firms also need supportive macro-economic environment, in which inflation is constrained and exchange rates are stable. Schiffer and Weder (2001) found that inflation and the exchange rate tend to affect smaller firms than larger firms. Bureaucratic process and corruption add costs of doing business and thereby reduce profitability of investment and growth of firms. The findings of Beck *et al.* (2005) reveals that financial, legal and corruption challenges disproportionately constrain the growth of smaller firms. The positive environment to expand business opportunities and enhancing firm capabilities to harness opportunities and promote firm growth include: a stable macroeconomic environment, the existence of mechanisms for contract enforcement and dispute resolution, consistency, so that business owners know what to expect and can assess risks, uninhibited flow of capital for foreign and domestic investment, a flexible labour regime, access to information and investment in education and technology.

A few studies have attempted to analyze firm growth in Ethiopia. For instance, Mengistae (1998) observed that growth rate of manufacturing firms decreases with firm age as well as size. Admasu (2006), Bigsten and Mulu (2007), and Mulu (2006) tested Gibrat's law using data from the manufacturing sector. The results showed that small firms grow faster than large enterprises

implying the Gibrat's law does not apply to the Ethiopian situation. The scope of these studies was limited to a specific aspect of firm growth in the manufacturing sector. This study, however, attempts to examine the overall environment to growth among grain trading firms in Addis Ababa and its surroundings. We contribute to the literature by investigating the constraints of firm growth with a focus on grain traders in Ethiopia. Grain traders are of particular interest given their central role in the performance of the food market in the country. In particular, in the era of escalating food prices since 2008, the Government of Ethiopia has become increasingly concerned the food market and has attempted to intervene in the market in multiple fronts, ranging from food distribution at subsidized prices and direct price control on selected products. We also consider how these interventions have impacted grain traders.

3. Data and Sample Characteristics

3.1 Data and study area

Primary data were collected through survey using structured questionnaire. A total of 250 grain traders were randomly selected and interviewed. The survey was conducted in December 2010 and January 2011. Although the main focus of this study was the grain market in Addis Ababa, nearby towns (Debrezeit and Nazareth) were also surveyed.⁵ Within Addis Ababa, 70% of the sample traders are from the central grain market known as Ehel Berenda while the rest were drawn from eight market centers of the city (Arada, Bole, Gulele, Kirkos, Kolfe-Keranyo, Lideta, Nifas Silk Lafto and Yeka). Information was also generated through focus group discussions with traders to get insights on the impacts of past, current and future government policies and other factors on grain trade activities. In additions, government statistics such as Central Statistical Agency's reports on grain production, consumption, price surveys, and other surveys, government policy documents, and other studies related to grain trading and milling were reviewed.

⁵ See Demeke and Ferede (2005) on the importance of the Addis Ababa grain market.

3.2 Characteristics grain trading firms

3.2.1 Growth and expansion of grain trading firms

Changes in average employment and storage capacity between time of start-up and time of survey (2011) have been used as indicators of growth of grain trading enterprises. Average number of employees⁶ showed little difference over time: the majority of the sample firms (64%) retained the same level of employment while 6.8% showed contraction in their employment levels (Table 1). About 29% reported expansion of employment levels, but 21% increased employment only by one or two persons.

Table 1: Change in employment and storage capacity between start-up and 2011

	Percent of respondents
Change in employment levels	
Reduced workers	6.80
No change	64.00
Increased workers	29.20
Change in storage capacity	
Reduced storage capacity	0.40
No change	88.00
Increased storage capacity	11.60

Source: Trader Survey, 2011

Grain trading is predominantly a family business with most of the labour coming from family members. Table 2 shows that very few firms employ more than 6 persons: the proportion of firms with an average of more than 6 employees was 3.2% at start-up and 6% in 2011. The overwhelming majority have 2 to 3 employees and this situation has not changed between establishment and survey year. The average number of workers (per enterprise) for the entire sample was 2.96 at the time of establishment and 3.33 in 2011.

⁶ Employees refer to persons employed by the firm, including salaried workers as well as paid or unpaid family members.

Table 2: Distribution of employment levels

	Initial year	2011
	Percent	Percent
0	2.0	0.8
1	16.8	13.2
2	34.4	31.2
3	22.4	20.8
4	11.6	12.0
5	6.0	10.8
6	3.6	5.2
7 -39	3.2	6.0
Total	100.0	100
Average	2.96	3.33

Source: Trader Survey, 2011

That the enterprises are small and stagnant is further confirmed by the data on storage capacity: as many as 88% of the sample firms reporting no change over the course of their existence, and only about 12% have expanded their storage capacity. Most firms (77%) were operating with stores of less than 30 ton capacity in 2011 (Table 3). Only about 9% of the firms reported a warehouse capacity of over 40 tons. Average warehouse capacity was reported as 24.5 tons in the year of establishment and 26.9 tons in 2011, implying that the firms managed to increase their storage capacity by less than 3 tons over the course of their existence, 11.8 years on average. Such a small capacity of store indicates that traders handle small quantities and are not engaged in keeping stocks beyond their day to day sales and buying activities. They have little or no capacity to undertake temporal arbitrage, i.e. storing grain from one harvest period to a later period. The stores are basic shade structures (cement floor, corrugated-iron roof, and half wall) used for keeping stack of grain-filled bags (made from woven plastic). No cleaning or grading services are provided in these stores.

Table 3: Distribution of warehouse size

	At start-up	Time of survey (2011)
	Percent	Percent
Less than or equal to 10 tons	26.00	21.60
1 to 20 tons	20.00	20.40
21 to 30 tons	32.80	35.20
31 to 40 tons	14.40	13.60
> 40 tons	6.80	9.20
Total	100.00	100.00
Average capacity (tons)	24.5	26.9

Source: Trader Survey, 2011

3.2.2. Individual and firm characteristics

Owner/ manager characteristics

A significant proportion of the grain trading firms are run by young individuals. Some 43% of the owners or managers are less than 35 years old. Hence, most of the owners or managers have limited experience in grain trading, with about 61% reporting to have less than 10 years of experience in grain trading businesses. This indicates the instability of grain marketing sub-sector and higher exit from the markets, influencing firm growth. Women owners/managers account for only 10% of the grain traders. Women also account for 6.6% of total workers (Table 4). The business involves a lot of negotiations and bargaining with sellers, buyers, brokers, transporters and handlers (loading/unloading) as well as physical handling of sacks of grain that many women may find difficult to manage.

Table 4: Gender of owner/managers and working staff

Sex	Owners/managers		Workers	
	No	%	No	%
Male	224	89.6	894	93.4
Female	26	10.4	63	6.6
Total	250	100	957	100

Source: Traders Survey, 2011

The majority (51%) of firms are owned and managed by people with primary and middle level education (1-8 years of education) or less (Table 5). Some are illiterate (5.2%) or have only religious education (1.2%). About 38% have high school level of education (9-12 years of education). The proportion of grain traders with higher (e.g. beyond high school) educational achievement is very low: Only 7% have college or university level education. Employees working for traders have even lower level of education; about 19% are illiterate or with only religious education. The lower level of educational attainment may indicate that grain trade does not attract educated people with new ideas or visions that can transform the sector.

Table 5: Educational level of owners/ managers

Percent	
Illiterate	5.2
Religious education	1.2
1-4 years of education	10.8
5-8 years of education	33.6
9-12 years of education	38.0
Technical and Vocational school training (TVET)	3.6
College level	6.0
BA and above	1.2
Other (specify)	0.4
Total	100.0

Source: Trader Survey, 2011

Firm characteristics

The vast majority of the sample trading enterprises (93%) are owned under sole proprietorship. Other forms of ownership such as partnership, share company or cooperatives account for less than 7% of the respondents (Table 6). Sole ownership restricts the opportunity of mobilizing more resources and investing in growth. This is aggravated by the limited access to loans from formal financial institutions and underdeveloped capital market in the country.

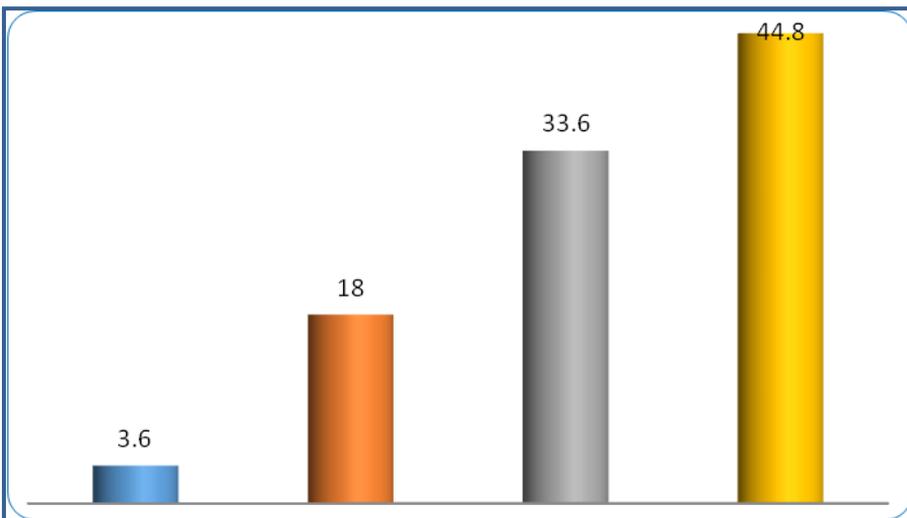
Table 6: Ownership form of grain trade enterprises

	Percent
Sole ownership	93.2
Partnership	2.8
Private limited company	0.8
Share Company	1.2
Cooperative	0.8
Others (specify)	1.2
Total	100.0

Source: Trader Survey, 2011

More than two-thirds of the enterprises were established after 1992, suggesting that the reforms following the overthrow of the former socialist government have played a positive role in promoting the private sector (Figure 3). However, a large proportion of the firms (about 45%) were established more recently, between 2003 and 2011. The recent high prices seem to have encouraged more entry into grain trade but lack of experience and volatile prices could make the new entrants more vulnerable and expanding trading activities a risky venture.

Figure 3: Firms by year of establishment



Source: Trader Survey, 2011

Nearly all sample traders own weighting equipment and sacks and a simple pointed tubular device, known as *memermeria*, for taking samples from sacks (to ascertain quality). Major assets such as warehouses and trucks are also critical for grain traders to undertake temporal and spatial arbitrage activities. However, more than 98 percent of traders do not have trucks of any type (Table7). Only a small proportion (about 10%) of traders have their own store and the vast majority rely on rented store from government (63%) or individuals (25%) (Table 7). As indicated above, the stores are very small (with an average capacity of 26.9 tons) and are often made of mud- or brick-walled houses topped by corrugated iron roofs. There are no traders with silos or modern warehouse structures. Traders lack the appropriate storage structures with ventilation and handling facilities. Limited investment in major fixed assets is also associated with the fact that the market centres are built by the municipality with no provision for individual traders to invest and expand the structures.

Table 7: Truck and warehouse ownership over the last 12 months (% reporting)

Truck	
Small truck (e.g. ISUZU)	1.6
Medium truck (e.g. FSR)	1.2
Large truck	0.8
Warehouse	
Owned	9.6
Rented from government	63.2
Rented from individuals	25.2

Source: Trader survey, 2011

Horizontal and vertical linkages and cooperation

Although contractual linkages with the different operators along the value chain and membership in traders' association would help improve supply chain efficiency, growth and business competitiveness, most of the respondents have no such linkages. Grain purchase through contract farming was reported by only in two cases (0.8%) while purchase from farmers with no contract by 30

traders (12%) (Table 8). Traders get their supplies from spot markets where commodities are bought for cash and delivered immediately.

Traders sell grain to different types of clients and their most important clients are consumers and retailers: about 77% and 69% of the respondents sell to consumers and retailers, respectively (Table 8). About 48% sell to millers who then retail to consumers. There are no formal contractual agreements between the traders and the buyers. Buyers and sellers (or their agents/brokers) meet in person and negotiate over price and quality. The quality is established through inspection on the spot. Bargaining over price often takes a lot of time as sellers start by quoting higher prices while buyers offer lower prices. Both converge to a middle ground and agree on a price which is often kept secret. There is no invoicing or paperwork to indicate product specifications or quality guarantee. Ownership of the commodity is transferred as soon as the payment is made in cash. Although social relations and networks often instil trust and facilitate transaction, there are no formal horizontal and vertical linkages. With no agreements and contracts with sellers and buyers, traders cannot protect themselves against price fluctuations. The traditional marketing systems and volatility of prices (see above) do not encourage investment in stocks, warehouses, cleaning facilities, etc. Instant buying and selling is a common practice.

Participation in association is also weak as more than half of the sample traders are not members of a traders' associations (Table 9). It appears that the benefit of joining association is limited: most association members indicated that they have not benefited from improved access to credit, information, commercial contracts, dispute settlements, negotiating with authorities, etc. (Table 9). Over 80% of the members believe that association has not helped them in accessing credit, establishing commercial contracts, protecting them from unfair competition, or coordinating their transactions. Inadequate benefits seem to have discouraged traders from participation. The formal network situation is very poor and traders lack collective voice and action to influence policies and reduce transaction costs.

Table 8: Sources of grain purchase and types of buyers in the last 12 months (%)

	Yes	No
Source of grain purchase		
Farmers (no contract)	12.0	88.0
Contract farmers	0.8	99.2
Rural market	22.8	77.2
Assemblers	32.8	67.2
Wholesalers	46.8	53.2
Others (mainly brokers)	28.0	72.0
Buyers of grain		
Millers	48.0	52.0
Retailers	69.2	30.8
Consumers	77.2	22.8
Aid agencies	9.2	90.8
Others	11.2	88.8

Source: Trader Survey, 2011

3.2.3 Business and market environment: Access to finance, insurance, infrastructure and market institutions

Finance

A majority (about 75 to 79%) of the sample traders consider internal or own source to finance working capital or investment needs of their businesses as most important for their business (Tables 9). Borrowing from formal sources (e.g. banks) is reported by only about 6% of the sample traders. Although about 83% of the sample traders have bank accounts (Table 10) and are familiar with bank transactions, the use of formal sources such as banks and micro-finance institutions (MFIs) have limited importance. Collateral requirements are major impediments to accessing loans from formal sources (Amha *et. al.*, 2012).

Traders were also asked if they have ever borrowed money from external sources in the course of their operation. Only about 12% have ever borrowed from formal sources such as banks, microfinance institutions (MFIs) or NGOs (Table 10). Borrowing from friends and relatives is relatively more common as reported by about 50% of the respondents. About 16% have borrowed from

*iqub*⁷ and 3% from saving and credit cooperatives in the course of their existence.

Table 9: Most important source of finance to meet working capital and investment needs (%)

Source	Working capital	Investment
Own savings or retained earnings	74.8	78.8
Borrowing from formal sources	5.6	6.4
Borrowing from informal sources (money lenders, <i>iqub</i> , relatives/friends, etc.)	5.2	4.4
Supplier credit	11.2	4.8
Cash advances from clients	2.4	2
Other (specify)	0.8	3.6
Total	100	100

Source: Trader Survey, 2011

Table 10: Ever received credit from external sources (%)

Source of external credit	Yes	No	Total
Formal banks	7.6	92.4	100
MFI	4.0	96.0	100
NGOs	0.8	99.2	100
<i>Iqub</i>	16.4	83.6	100
Saving and credit cooperatives.	3.2	96.8	100
Friends and relatives	50.4	49.6	100
Others (mainly supplier credit)	6.4	93.6	100

Source: Trader Survey, 2011

Own finance is often augmented through rotating saving and credit association (ROSCA), locally known as *iqub*. About 48% of the respondents were members of *iqub* at the time of this survey was conducted in January 2011. The gap between actual working capital used and working capital required over the last 12 months (2011) is huge (Table 11). The actual working capital used is less than 40% of the required capital for about 52% of

⁷ Informal institution collecting money from members on regular time intervals to give the money to a member in a circulating manner.

respondents. On average, each trader manages with his/her grain trade business with a working capital of a little over US\$5 thousand (compared to the required average working capital of over US\$21 thousand).

Table 11: Share of working capital actually used as proportion of the working capital required

Proportion	Percent
<=20%	28.8
20.1 - 40%	23.6
40.1 - 60%	19.6
60.1 - 80%	14
80.1 - 100	14
	100
Mean working capital actually used	88,096.0 Birr 5182 (US\$)l
Mean working capital required	367,417.7 Birr (21,613 US\$)

Source: Trader Survey, 2011

Infrastructure

Traders were asked whether or not the overall situation of infrastructure (e.g. roads) has been favourable for growth and expansion. A majority (61%) of traders agreed the situation is favourable. This is consistent with the recent surge in public investment in roads. Yet, there has not been any major effort to improve storage infrastructure. Apart from losses in terms of quality and quantity wastage, price fluctuations are aggravated by the absence of proper warehouse facilities. Traders at the central market are also affected by congestion due to lack of grain marketing space. The market place (*Ehil Berenda* in Addis Ababa) was built some 50 years ago when the population of the city was probably less than a third of its current size. Traders have also reported inadequate availability of transport services and high transport charges as important infrastructural constraints that have negatively affected their grain business activities (Table 12). High fuel prices have increased transport costs in recent years. The use of small trucks (less than 10 ton capacity) has also contributed to high transport charges and increasing grain prices.

Nearly all traders (owners/ managers) have mobile telephone and most have no complaints about high telephone charges. However, the use of internet or email is largely unknown; only 5 respondents (2%) reported using emails in communicating with suppliers and clients. Internet browsing is even more limited (about 1%). Internet usage in Ethiopia is one of the lowest in Africa, with a penetration rate of 0.7% as of December 31, 2011, (<http://www.internetworldstats.com/stats1.htm>).

Table 12: Perceptions of grain traders about selected infrastructural constraints

	Inadequate availability of transport	High transport charges/ price	High telephone charges/price
No problem	21.2	12.0	46.8
Minor problem	27.2	15.7	18.4
Moderate problem	23.6	18.9	13.6
Major problem	12.8	21.7	11.6
Very severe problem	15.2	31.7	

Source: Trader Survey, 2011

Nearly all traders (owners/ managers) have mobile telephone and most have no complaints about high telephone charges. However, the use of internet or email is largely unknown; only 5 respondents (2%) reported using emails in communicating with suppliers and clients. Internet browsing is even more limited (about 1%). Internet usage in Ethiopia is one of the lowest in Africa, with a penetration rate of 0.7% as of December 31, 2011, (<http://www.internetworldstats.com/stats1.htm>).

Market institutions

There have been recent initiatives to disseminate market information that includes broadcasting of grain price quotes on selected central and regional markets in the country through radio. The ECX is also posting daily grain prices in its website. However, close to 92% of the sample traders reported to have obtained market information from unofficial sources such as friends and brokers (Table 13). Traders may not have trust in official price information systems that do not capture quality as well as the all too important informal

grades and standards that vary by origin (production area), colour, moisture content, and extent of impurities. Spot prices also tend to vary with each transaction, depending mostly on the bargaining power of sellers and buyers. It is thus almost impossible to observe single daily spot prices. Market information is of little value in the absence of an objective and a formal system of grades and standards and open auction prices.

Table 13: Sources of market information (%)

Sources by official and unofficial	
Official sources	8.4
Unofficial sources	91.6
	100.0
Unofficial sources of information	
Friends and fellow traders	68.1
Brokers	31.9
	100.0

Source: Trader Survey, 2011

3.2.4 Government regulations and policies

Illegal traders

The central grain market is a place where licensed traders and brokers operate along with a large number of informal intermediaries (without license and stall). Informal traders do not pay taxes or rents (for those selling grain on trucks) and have competitive edge over those operating with license. They also enter the grain trade when conditions are favorable and exit out when the situation is difficult, hence forcing licensed traders to operate with small margins and no capacity and incentive to invest in growth and expansion. There is no enforcement mechanism and police protection against unlicensed operators. The presence of unlicensed traders was identified as one of the most important problems when traders were asked about constraints to increasing revenue from their business (Table 14).

Table 14: Most important constraint in increasing your revenue from this business

	Percent
Financial constraint	26.3
The presence of illegal traders	28.3
Lack of demand	6.3
High competition	7.1
High input price	6.3
Unstable price	8.3
Poor social network	3.3
Inconvenient working place	5.4
Lack of quality product	3.8
Supply shortage	2.1
Lack of skill/knowledge	1.7
High collateral requirement	.8
Poor policy implementation	.4
Total	100.0

Source: Trader Survey, 2011

Contract enforcement

The exchange process in the spot market is completed as per the terms of the negotiated price and contract. If the process involves resolving disputes, court action is used to enforce contracts. However, contract enforcement in Ethiopia takes a lot of time and money: it takes 690 days to settle disputes and the cost of recovery is very high for formal and registered firms. The cost in terms of time and finance is expected to be much higher for informal firms (Rashid and Minot, 2010). When asked why it is difficult to make contractual arrangements with farmers, traders mentioned supply instability, lack of trust and price volatility as the main problems. The same problem has affected linkage with processors. In other words, owing to inadequate institutional environment for contract enforcement, grain trading firms are forced to limit their transactions within the confines of a few trusted partners with no effort to forge horizontal and vertical integration in the grain value chain.

Overall policy environment

Traders were asked about the impact of some policies to gauge their perception about the general business environment. For instance, most traders (over 90%) agree that licensing procedures are not a problem. Only about 11% also described high taxes as major or very serious problem (Table 15). On the other hand, more than a third (36%) indicated that they felt threatened by government action to import wheat and sell at subsidized prices. Most traders do not keep stocks and have no contractual obligations, hence they may not be affected by government interventions that tend to lower prices. On the other hand, lack of consistency in the policies of the government could be one of the reasons behind keeping limited stocks and constraining expansion of their business. Nevertheless, relatively more number of traders (42%) reported to have been affected by unexpected price changes over the last three years.

Table 15: Perceptions on licensing, taxes, wheat import, consultation and price intervention

		Percent
Is licensing procedure a problem	Yes	92.0
	No	8.0
	Total	100.0
What is your view about tax	Not a problem	44.0
	Mild or moderate problem	45.1
	Major problem	6.9
	Very serious problem	4.0
	Total	100.0
Has public wheat import and sell at subsidized prices affected your business?	Yes	36.0
	No	64.0
	Total	100.0
What is the extent to which business sector is consulted in designing rules and regulation?	Always	1.6
	Most of the time	12.0
	Sometimes	36.8
	Seldom	16.8
	Never	32.8
	Total	100.0
Has unexpected price intervention over the last 3 years affected your business?	Yes	41.6
	No	58.4
	Total	100.0

Source: Trader Survey, 2011

3.2.5 Constraints to growth

Traders were asked if growth and expansion has been an important objective of their business. The vast majority (about 88%) of the sample traders indicated that growth is an important objective for their business. However, the ambition to grow does not include moving into regional and international trade for most traders (66%). None of the traders has ever imported or exported grain partly because of government restrictions and partly due to large capital requirements as well as the high cost of logistics. With no large-scale grain trading firm in the market, growth and expansion is likely to be understood in a narrow or limited perspective of adding a few more employees to serve primarily small domestic market.

In response to a question that enquired about most important growth obstacles, the respondents identified several factors and the two most important were financial constraints and the problem of illegal traders. Limited access to finance is perceived as the most binding constraint by 48% of the respondents while illegal traders are viewed as the most important by 25% (Table 16). About 7% of the traders considered price instability as their most important constraint. Inadequate premise (7%) and lack of business support services (2%) were also mentioned as most important problems. Other problems identified include high price, lack of business skills and inadequate infrastructure.

Table 16: Most important obstacle to the growth/expansion of this business

	Percent of respondents
Financial constraints	47.8
The presence of illegal traders/brokers	24.7
Inadequate premise/working place	6.5
Price instability	6.9
Lack of demand	4.0
Lack of business support services	2.4
Others	7.6
Total	100.0

Source: Traders Survey, 2011

Traders were asked about the impact of the ongoing grain price inflation on their business. The vast majority (96%) consider high prices as a problem, rather than as an opportunity. Those who consider high price as a problem were further asked to explain the reasons: about 55% reported that high prices reduce demand or reduce volume of sales or reduce profitability (Table 17). Traders' margins are bound to decline with the decline in the volume of sales. Although it is generally claimed that demand for grains (basic necessities) is price inelastic, it appears that consumers, especially the poorer ones, are reducing their purchases in response to high prices. Many consumers are likely to shift their purchase from the most widely traded and most expensive cereals (e.g. *teff*) to cheaper and less traded ones (e.g. maize).

Another major problem of high price is its impact on working capital. About 27% complained that high prices create financial difficulties by increasing the cost of buying grain (Table 17). For some of the respondents (19%), the main problem of high prices is the price instability it creates. In the absence of access to finance, it appears that high grain prices rather induce contraction, not growth and expansion of grain trade businesses.

Table 17: Perceptions on current inflation (%)

Current inflation as:

Opportunity	4.0
Problem	96.0
Total	100

If perceived as a problem, indicate one main reason:

Decreases demand or reduce sales volume or reduces profitability	54.7
Creates financial shortage or increase the cost of grain purchase	26.5
Creates price instability	18.6
	100.0

Source: Trader Survey, 2011

4. Determinants of Growth

4.1 The basic model

We use changes in employment between establishment and survey period as a proxy for firm growth. Using this indicator, three categories of firms were identified: contracted, stagnated and expanded. In so doing, we estimated an ordered probit model to examine the main drivers of firm growth. The dependent variable takes three values, indicating the three categories of firms.

Firm growth can be influenced by a battery of factors such as finance, human capital, technology (or innovation) and other factors. In a more general form, the determinants of firm growth can be expressed as:

$$y_i = G(X_i, F_i, T_i)$$

Where, y_i is firm growth, X_i is a vector of owner-specific characteristics, F_i is a set of firm-specific factors, T_i is a vector of other factors such as credit, technology, infrastructure, etc. Specifically, firm performance can be modeled using an ordered probit approach (Greene, 1997), and assume that the observed firm performance can be generated by as latent variable y^* .

The latent variable is, in turn, related to a battery of observable and unobservable factors of the form:

$$y^* = Z' \theta + \varepsilon$$

Where $Z = (X, F, T)$ is a vector of explanatory variables, θ is a vector of parameters to be estimated and ε is error term which follows a normal distribution. We then relate the latent variable to the observable variable y as:

$$y = \begin{cases} 1 & \text{if } y^* \leq \psi_1 \\ 2 & \text{if } \gamma_1 \leq y^* \leq \psi_2 \\ 3 & \text{if } y^* \geq \psi_2 \end{cases}$$

Where ψ is a threshold parameter which can be estimated together with other parameters in the model. The empirical model assumes the following form:

$$P(y = j / X) = \begin{cases} \Phi(\psi_1 - X' \theta), & \text{if } j = 1 \\ \Phi(\psi_2 - X' \theta) - \Phi(\psi_1 - X' \theta), & \text{if } j = 2 \\ 1 - \Phi(\psi_2 - X' \theta), & \text{if } j = 3 \end{cases}$$

Where, Φ is the cumulative normal density function and j is the number of categories (three in our case). Hence we estimate $P(y = j / X)$ model by including a set of explanatory variables which include firms' characteristics, financial variables and other owner-specific attributes. It should be noted that the coefficients estimated by these models cannot be interpreted as the marginal effect of the independent variable on the dependent variable. However, the coefficients can be interpreted by computing the marginal effects.⁸

Table 18: Variables included in the model

Variables	Description
<i>Dependent variables</i>	
Employment	Dummy variable: contracted, stagnated, and expanded
<i>Explanatory variables</i>	
I. Owner and firm characteristics	
Hhsex	Dummy variable: Owner/manager is male equals 1, otherwise 0
Ihheducat_1	Dummy variable: Owner/manager with less than or equal to 4 years of education equals 1, 0 otherwise (control variable)
Ihheducat_2	Dummy variable: Owner/manager with 5 to 8 years of education equals 1, 0 otherwise
Ihheducat_3	Dummy variable: Owner/manager with more than 9 years of education equals 1, 0 otherwise
Ihhagecat_1	Dummy variable: Owner/manager with less than or equal to 30 years of age equals 1, 0 otherwise (control variable)
Ihhagecat_2	Dummy variable: Owner/manager between 31 and 60 years of age

⁸ The marginal effects can be computed as:

$$\frac{\partial P(y = 1 / X)}{\partial X_l} = -\theta_l \left[f(\psi_{j-1} - X' \theta) - f(\psi_j - X' \theta) \right] \text{ where } f \text{ is the derivative of}$$

the cumulative normal distribution function and X_l is the l-th element in X.

	equals 1, 0 otherwise
Ihhagecat_3	Dummy variable: Owner/manager 61 and above years old equals 1, 0 otherwise
Ifirmagec~1	Dummy variable: Firm age is less than or equal to 5 years equals 1, 0 otherwise (control)
Ifirmagec~2	Dummy variable: Firm age is 6 to 10 years equals 1, 0 otherwise
Ifirmagec~3	Dummy variable: Firm age is 11 to 20 years equals 1, 0 otherwise
Ifirmagec~4	Dummy variable: Firm age is 21 years and above equals 1, 0 otherwise
Bustart	Dummy variable: Business established through inheritance, purchase or other similar means equals 1, 0 other wise
Dinworkers1	Dummy: 1 if number of workers at start-up is less than three, 0 otherwise
Dinworkers2	Dummy: 1 if number of workers at start-up is between three and five, 0 otherwise
Dinworkers3	Dummy: 1 if number of workers at start-up is greater than or equal to five, 0 otherwise
Risktaker	Dummy variable: Owner/ manager described him/herself as high risk taker equals 1, 0 otherwise
Association	Dummy variable: Owner/ manager member of traders association equals 1, 0 otherwise
Proddv	Number of products handled by the firm (1-3 = 1; 4-5 = 2; and 6+ = 3)
Incomedv	Dummy variable: All income from the grain trade equals 1, 0 otherwise (have other sources of income)

II. Access to finance

Creditformal	Dummy variable: Ever received external credit from formal sources (banks, MFIs, government projects NGOs, and saving and credit coops) equals 1, 0 otherwise
Creditinform	Dummy variable: Ever received external credit from informal sources (friends and relatives, , money lenders, , etc.) equals 1, 0 otherwise
	<i>Iqub</i> is the reference category

III. Access to market facility

Subcitycat	Dummy variable: Trader located in the central grain market (Addis Ketema) equals 1, 0 Otherwise
Storesc0	Initial store size divided by 100

IV. Policy and regulatory environment

Poorquality	Dummy variable: Poor quality or absence of grades and standards ranked as a problem (1 to 5) equals 1, 0 otherwise
Weakminfo	Dummy variable: Weak market information system ranked as a problem (1 to 5) equals 1, 0 otherwise
Weaklegal	Dummy variable: Weak legal system to enforce contracts ranked as a problem (1 to 5) equals 1, 0 otherwise
Highunstable	Dummy variable: High or unstable prices ranked as a problem (1 to 5) equals 1, 0 other wise
Pricdist	Dummy variable: Unexpected price distortion affected business over the last 3 years equals 1, 0 otherwise

4.2 Discussion of model results

The internal environment of the firms was examined using a number of factors: owner/manager age, owner/manager education, age of the firm, initial firm size (proxied by initial store size), attitude to risk, income diversification, product diversification, ownership of store, membership in association, business location, and how the business was started (Table 19). The likelihood of expansion is higher for older firms compared with young firms due to the former has a strong capacity in terms of assets and other resources, suggesting that older firms can have better resources and well-established clients and market opportunities compared with young firms. In addition, small firms have limited opportunity to learn in the course of their business operation.

Interestingly, firm size matters for firm growth, i.e. As for the education variables, only higher level of education (e.g. high school and above) is associated with higher firm growth, suggesting better education level of owners/ managers is strongly related to higher probability of firm growth. This also indicates that higher level of human capital is required for education to have a positive effect on firm growth as document in many empirical studies (e.g. Hanjra *et al.*, 2009).

Several variables, including association membership, attitude towards risk, and private ownership of store have the expected positive but insignificant coefficients. It would be recalled that members do not value highly the services of their association, confirming that association membership does not increase the likelihood of expansion. The income diversification variable is positive and statistically insignificant. On the other hand, diversification of products or commodities handled seems to be associated negatively with firm performance, suggesting specialization on a specific product can be associated with employment growth.

The external factors that may affect firm growth are broad and diverse and are often beyond the control of the firm: policy and regulatory environment, sources of external finance, access to market facilities and trader organization. Policy and regulatory environments are assessed using several variables,

mainly self-reported (subjective) problems of quality, grades and standards, policy unpredictability, constraints to market information, lack of legal services to enforce contracts, and distortions in market prices. Of these factors firm size, business location, access to finance, sudden distortions in market prices, and policy uncertainty strongly influence firm performance. Specifically, unexpected price distortion has a negative and highly significant coefficient. Traders who held the perception that prices are distorted (or had gone through such experience) seem to be more likely to refrain from investing in growth. They may avoid expansion to limit their exposure to price risks. Similarly, policy uncertainty hinders the likelihood of business expansion. The legal environment and government interventions affect the ability of firms to grow. In particular, unpredictable macro-economic conditions, resulting in part from poor policy management, frequent policy changes, and governance problems, are important in hindering business expansion. Without predictable government policies, it is very unlikely for firms to undertake investment activities to expand their businesses. A priority for government should be to reduce policy instability and inconsistency through better economic management and governance.

As already indicated, traders mainly use own sources but a few have accessed both formal and informal sources of external finance in the course of their operation. The coefficient of access to formal credit is negative, suggesting that external finance is negatively associated with firm growth. Given the small size of firms in terms of assets and other attributes, the effect of external financing on growth is stronger. This is due to the fact that smaller firms have limited collateral to offer and demand for smaller loans but face higher transaction costs and information asymmetries (e.g. Beck *et al.*, 2004b; Beck and Demirguc-Kunt, 2006). This suggests that the cost of external financing can be higher when firms are small. Higher collateral requirements in the formal financial institutions imply that banks are less willing to supply funds, thus making it more difficult to finance investments through bank loans as such investment requires long-term loans. In addition, the nature of credit allocation is such that it favours short-term loans at the expense of long-term financing. About 97% of loans from formal banks in Ethiopia require property collateral compared with Sub-Saharan Africa average of 85% (Demeke *et al.*, 2011). The average value of collateral required as proportion of the loan value

is much higher for Ethiopia (175%) compared with African average of 130% (Amha and Peck, 2010). This could necessitate greater reliance on informal sources to finance their business activities. The coefficient of informal credit is positively associated with firm growth and is statistically significant, indicating that informal finance play an important role in stimulating firm growth, especially when formal sources are inaccessible.

Access to market facility is measured indirectly based on whether the sample firms are located at the central market where there is a huge congestion or not (Sub-city). The results show that those traders located at the central market have lower likelihood of expansion. The facilities in other markets seem to provide better opportunities for expansion than the central market. The initial size has a positive coefficient in all the regression results. The result provides a strong support to the general perception that small efficient firms grow faster than their larger counterparts to overcome their initial scale disadvantage.

Table 19: Ordered probit results of determinants of traders' performance

Explanatory variables	I			II		
	Coef.	Robust Std. Err.	z	Coef.	Robust Std. Err.	z
Gender and education						
Dummy for gender (=1 if male)	0.3206	0.2027	1.58	0.2700	0.2103	1.28
Dummy for owner education: between 5 and 8 years	-0.1811	0.2607	-0.69	-0.0326	0.2711	-0.12
Dummy for owner education: more than 9 years	0.1644	0.2493	0.66	0.3723	0.2569	1.45
Age						
Between 31 and 60 years	-0.0968	0.2109	-0.46	-0.0378	0.2115	-0.18
More than 60 years	-0.5277	0.4437	-1.19	-0.3888	0.4330	-0.9
Between 6 and 10 years	0.0659	0.2294	0.29	-0.0408	0.2329	-0.18
Between 11 and 20 years	-0.0284	0.2465	-0.12	-0.1130	0.2432	-0.46
Above 20 years	0.5034*	0.2830	1.78	0.3749	0.2859	1.31
Capital						
Dummy for number of workers at start-up: between three and five	0.1006	0.1947	0.52	0.0621	0.1975	0.31
Dummy for number of workers at start-up: greater than or equal to five	-0.3334	0.2626	-1.27	-0.4061	0.2890	-1.41
Location, experience and risk						
Sub-city category (=1 if located in central grain market)	-0.6523***	0.2144	-3.04	-0.4955**	0.2301	-2.15
Dummy for how business started-self	-0.0160	0.1814	-0.09	-0.1872	0.1882	-0.99
Dummy for previous experience	-0.0250	0.1616	-0.15	-0.2124	0.1649	-1.29
Dummy for risk (high risk taker=1)	0.0385	0.1849	0.21	0.1077	0.1931	0.56
Store size and membership						
Dummy for membership in trader association	-0.1638	0.2152	-0.76	-0.0748	0.2226	-0.34
Dummy for own store	-0.0148	0.2982	-0.05	0.1081	0.3062	0.35

Initial store size	0.3127***	0.0703	4.45	0.3149***	0.0819	3.84
Diversification indicators						
Product diversification	-0.2335*	0.1225	-1.91	-0.2107*	0.1243	-1.7
Income diversification	0.3019	0.1898	1.59	0.3140	0.2042	1.54
Access to finance						
Formal credit	-0.7690***	0.2387	-3.22			
Informal credit				1.1746***	0.1852	6.34
Regulatory and related environment						
Dummy for weak legal system	0.1381	0.3606	0.38	0.1640	0.4026	0.41
Dummy for weak market information	0.0199	0.2216	0.09	0.1124	0.2370	0.47
Dummy for poor quality or absence of grades	0.0558	0.1736	0.32	0.0125	0.1835	0.07
Dummy for unexpected price distortion	0.5266***	0.1648	3.19	0.6909***	0.1666	4.15
Dummy for policy unpredictability	0.2857*	0.1682	1.7	0.1731	0.1713	1.01
/cut1	-2.0207	0.4909		-1.3285	0.5165	
/cut2	0.5215	0.4999		1.4598	0.5447	
Number of observations				250		
Wald chi ² (25)	100.48			104.7		
Prob > chi ²	0.000			0.000		
Pseudo R ²	0.185			0.262		

***, $p < 0.001$, **, $p < 0.05$, *, $p < 0.10$

5. Conclusion

The central objectives of this study were to describe both internal and external factors affecting grain market improvement and development in Ethiopia, and to evaluate the relative impacts of the different factors on growth of grain traders.

The results of the sample survey reveal that grain traders have very primitive mode of business operation such as little equipment, few employees, weak human capital, absence of dynamism, etc. Changes in average employment and storage capacity between time of start-up and time of survey (2011) have been used as indicators of growth of grain trading enterprises. Both the average number of employees and warehouse capacity showed no or very little difference over time, an indication of stagnation. For instance, the majority of sample firms reported no change in warehouse expansion over the course of their existence. Such a small capacity of store indicates that the traders handle small quantities of grain and are not engaged in keeping stocks beyond their day to day sales and buying activities. In addition, they have little or no capacity to undertake temporal arbitrage. Competition fails to operate as a selection mechanism due to the existence of both internal and external factors which hamper firm performance. Lack of credit, weak human capital, shortage of management, lack of access to premises with suitable infrastructure, policy and regulatory constraints, and unfavorable price regimes, among others, hamper the growth of firms. Firms, especially small grain trading enterprises seldom graduate into larger-scale operations.

Although the policy and regulatory environments and infrastructural issues have been favourably rated, there is still much room for improvement. Government policies and institutions do matter for firm growth since unpredictable macro-economic conditions, resulting in part from poor policy management, frequent policy changes, and governance problems, are important causes of instability affecting firm growth. Without predictable government policies, it is very unlikely for firms to undertake investment activities to expand their businesses. A priority for government should be to reduce policy instability and inconsistency through better economic management and governance.

Overall, the central message of this study is that without renewed focus on promoting firm growth, especially grain traders through improving access to warehouses, relaxing credit constraints, and improving the macroeconomic and regulatory environment, not only grain traders but also rural and urban households will face a very uncertain and untenable future which will hamper the battle against poverty, food insecurity and ensure growth and transformation within the grain marketing sub-sector. It should be noted that transformational firm growth requires increased level of investment and rising productivity. This is achieved by establishing a strong enabling environment for private sector development which includes, among other things, macroeconomic stability, a robust legal and regulatory system (e.g. secure contract and property rights), improved access to finance, investment in education, promoting innovations and workforce skills, and infrastructure development. In order to unlock the full potential that improved trade practices play in the economy, traders must embrace new business models, be reorganized into more commercially oriented businesses and integrate their trade activities into more sophisticated supply chains that can effectively link them to producers and potential processors.

References

- Admasu S. (2007). 'Entry, survival and growth of manufacturing firms in Ethiopia.' working Paper Series Number, 425.
- Amha, W., D. Demeke, and T. Ferede. (2012). Improving financial access to expand the activities and growth of grain traders and millers. Evidence from Ethiopia, a research report prepared for FAO, Rome, Italy (Draft).
- Amha, W., and D. Peck. (2010). Agricultural finance in Ethiopia: Diagnostic and recommendation. A draft report submitted to Bill and Melinda Gates Foundation (BMGF).
- Bates, T. (1985). Entrepreneur human capital inputs and small business longevity," *Review of Economics and Statistics*, 72: 551-559.
- Becchetti, L., & G. Trovato. (2002). 'The determinants of growth for small and medium sized firms: The role of the availability of external finance', *Small Business Economics*, 19: 291-306.
- Beck, T., A. Demircug-Kunt and V. Maksimovic. (2005). 'Financial and Legal Constraints to Growth: Does Firm Size Matter?' *Journal of Finance*, 60:137-177.
- Brown, J., J. Earle, and D. Lup. (2004). What Makes Small Firms Grow? Finance, Human Capital, Technical Assistance, and the Business Environment in Romania. Upjohn Institute Staff Working Paper No. 03-94.
- Bigsten, A., Mulu, G. (2007). The small, the young, and the productive: Determinants of manufacturing firm growth in Ethiopia'. *Economic Development and Cultural Change* 55 (4), pp. 813-840.
- Carpenter, R., and B. Petersen. (2002). Is the growth of small firms constrained by internal finance? *Review of Economics and Statistics*, 84:298-309.
- Chole, E. and M. Manyazewal. (1992). The macroeconomic performance of the Ethiopian economy. In: Mekonnen Tadesse (ed.) proceedings of the First Annual Conference on the Ethiopian Economy, Addis Ababa, Ethiopian Economic Association.
- Colombo, G. and L. Grilli. (2005). 'Founders' human capital and the growth of new technology based firms: a competence-based view', *Research Policy*, 34:795-816.
- Cooper, A. C. (1993). "Challenges in predicting new firm performance", *Journal of Business Venturing*, 8:241-253.
- Demeke, M., Dawi, D., Tefft, J., Ferede, T. and Bell, W. (2012), Stabilizing food price incentives for staple grain food producers in the context of broader agricultural policies: Debates and country experiences, FAO, ESA, Working Paper No. 12-05-2012.

- Demeke, M. and T. Ferede. (2005). 'Grain Marketing in Addis Ababa, Ethiopia', In: Omamo *et al.* (eds.): *The Future of the smallholder Agriculture in Eastern Africa: The roles of state, Market, and civil society*, IFPRI Eastern Africa Food Policy Network: 233-297.
- Desai, M., P. Gompers and J. Lerner. (2005). Institutions, Capital Constraints and Entrepreneurial Firm Dynamics: Evidence from Europe. Harvard NOM Working Paper No. 03-59.
- De Soto, Hernando. (1987). *The Other Path*. New York: Harper and Row.
- Ethiopian Roads Authority. (2009). *RSDP Performance: Twelve Years Later*. Addis Ababa, Ethiopia.
- Evans, D. S. (1987). "The relationship between firm growth, size and age: Estimates for 100 manufacturing industries," *Journal of Industrial Economics*, Vol.35, p.567-581.
- Fafchamps, M. (2000). 'Ethnicity and Credit in African Manufacturing', *Journal of Development Economics*, 61:205-235.
- FAO (2010b) FAOSTAT Database, http://www.fao.org/statistics/http://faostat.fao.org/site/573/DesktopDefault.aspx?PageID=573#a_ncor
- Getnet, K. (2005). Behavior of farmers towards price changes beyond liberalization of grain markets in Ethiopia, Ph.D. dissertation, Ghent University, Belgium.
- Hart, P. (2000). 'Theories of Firms' Growth and the Generation of Jobs', *Review of Industrial Organization*, 106:1242-52.
- Hanjra, M. A., Ferede, T. and Gutta, D. G. (2009). Pathways to breaking the poverty trap in Ethiopia: Investments in agricultural water, education, and markets. *Agricultural Water Management* 96: 1596-604.
- Heshmati, A. (2001). On the Growth of Micro and Small Firms: Evidence from Sweden, *Small Business Economics*, 17 (3): 213-228.
- IFPRI. (2010). Maize value chain potential in Ethiopia: Constraints and opportunities for enhancing the system, Working Paper (July).
- Jo, H., and J. Lee. (1996). 'The relationship between an entrepreneur's background and performance in a new venture', *Technovation*, 16:161-171.
- Johnson, S., J. McMillan and C. Woodruff. (2002). 'Property Rights and Finance', *American Economic Review*, 92:1335-56.
- Kantis, H., Moorri-Koening, V. and Angelelli, P. (2004). *Developing Entrepreneurship. Experience in Latin America and Worldwide*, Inter-American Development Bank, Washington, DC.
- Klapper, L., L. Laeven, and R. Rajan. (2004). Business Environment and Firm Entry: Evidence from International Data, CEPR Discussion Paper No. 4366.

- Mead, D. and Liedholm, C. (1998). "The dynamics of micro and small enterprises in developing countries", *World Development*, Vol. 26 No. 1, pp. 61-74.
- Mengistae, T. (2001). Indigenous Ethnicity and Entrepreneurial Success in Africa: Some Evidence from Ethiopia, Policy Research Working Paper 2534, World Bank, Washington, DC.
- Mengistae, T. (1998). Ethiopia's Urban Economy: Empirical Essays on Enterprise Development and the Labour Market, D. Phil Thesis, Department of Economics, University of Oxford.
- McPherson, M. (1996). "Growth of micro and small enterprises in Southern Africa", *Journal of Development Economics*, Vol. 48 No. 2, pp. 253-77.
- Minot, N. (2010). Transmission of world food price changes to markets in sub-Saharan Africa. Report prepared for the U.K. Department for International Development under the project "Assessing Impact of Increased Global Food Price on the Poor." Washington, DC: International Food Policy Research Institute.
- Mulu G. (2006). 'Do size and age matter? Growth of firms in Ethiopian manufacturing.' Goteborg University, Goteborg.
- Parker, J. (1995). Patterns of business growth: Micro and small Enterprises in Kenya. Ph.D. dissertation, Michigan State University, East Lansing, Michigan.
- Rajan, R., and L. Zingales. (1998). 'Financial Dependence and Growth', *American Economic Review*, 88:559-86.
- Roberts, E. (1991). 'The technological base of the new enterprise', *Research Policy*, 20:283-298.
- Schiffer, M. and Weder, B. (2001). "Firm Size and the Business Environment: Worldwide Survey Results." IFC Discussion paper 43.
- Snodgrass, D. & Biggs, T. (1996). Industrialization and the Small Firm: Patterns and Policies. International Center for Economic Growth.
- Storey, D. (1994). *Understanding the small business sector*, Rutledge, New York.
- Tybout, J. (2000). Manufacturing Firms in Developing Countries: How Well Do They Do, and Why? *Journal of Economic Literature*, 38(1).
- Variyam, J. N. and D. S. Kraybill. (1992). 'Empirical evidence on determinants of firm growth', *Economics Letters*, 38 (4), 31-36.

Informal Crossborder Livestock Trade Restrictions in Eastern Africa: Is there a case for free flows in Ethiopia-Kenyan Borderlands?

Wassie Berhanu¹

Abstract

The case of informal cross border livestock trade in Ethiopia-Kenya border areas is examined with the intention to clear some doubts on conventional perceptions and broadly explore the implied effects of restrictive official interventions on the welfare of the peripheral population. The informal channel accounts for an estimated 71% of total value of live animal exports and 78% of consumer goods and productive inputs imported into the area. It is found that cross border livestock trade restrictions could lead to substantial drops in pastoral household welfare. In the case of Ethio-Kenyan borderlands, the informal traded livestock flows rather appear to be mutually beneficial, and should be guided by bilateral cross border co-operation of free flows.

Keywords: Cross border trade, village SAM, pastoralism, Borana, Ethiopia

JEL classification: O13, O17, P45, Z13

¹ Department of Economics, Addis Ababa University

P. O. Box 1176, Addis Ababa, Ethiopia; Email: wbpresearch@yahoo.co.uk

Acknowledgements

The author is very glad to thank Ermias Engida for his valuable assistance. The research project was supported by Ministry of Finance and Economic Development (MOFED) of Ethiopia and the Department of Economics, Addis Ababa University.

1. Introduction

This paper seeks to broadly explore the effects of informal cross border livestock trade restrictions on the welfare of a peripheral herder community in eastern Africa. Informal cross border trade (ICBT) in the context of this study is generally referred to as unregistered/unregulated transboundary trade in *clean* commodities, which involves multiple actors along an established long distance supply channel, and facilitated by indigenous institutional networks and financing mechanism of exchange operations assisted by informal *foreign exchange* markets in border areas (Little, 2007; Umar & Baulch, 2007). Informal cross border livestock trade operators are dealers in a legitimate product (livestock) in a peripheral economy characterized by longstanding isolation and poor access to centrally provided basic socio-economic services. The participants in the business are either informal small scale operators or recognized dealers trying to fully or partially escape the big cost of inconvenience, less attractive profit margins and the relatively unfair transaction deals of the centrally regulated formal export channel. The system is commonly operated by unlicensed agents or a few recognizable traders motivated to partly circumvent the drudgery of toiling along the formal channel, i.e. individuals who are generally enticed to respond to better market opportunities on certain established routes of unofficial transborder trade operations. An elusive nature of the term ICBT, as evidently argued in Little (2007), is that unofficial cross border livestock trade operations are not necessarily purely tax evasive. Marketed pastoral livestock usually primarily progress through officially known market centres of stringent local government tax collection arrangements before their ultimate diversion into the informal cross border channel of no further official checkpoints (see Little, 2007, for details of definitional issues).

The Horn of Africa is often considered as a region of the largest informal transborder traded livestock movements in the world. This is operated along long distance routes and market corridors leading to transit port destinations of Berbera, Bosaso and Djibouti, which serve the final export markets in Middle East countries (Desta, Berhanu, Sebsibe, & Guerne Bleich, 2011; Umar & Baulch, 2007; Mahmoud, 2010; Majid, 2010). It is very difficult to

convincingly establish the approximate size of informal cross border livestock trade transactions due to the unregulated nature of the operation. However, there is clear evidence that the largest proportion of livestock trade operations in the eastern Africa region is characteristically directed through the unofficial channel (Desta et al., 2011; Little 2007, 2009). The informal trans-border pastoral trading system in this region have resiliently survived and flourished under the region's distressing conditions of political rivalry, armed conflicts, unpredictable border closures, and storms of other restrictive interventions (Desta et al., 2011). The flourishing prevalence of informal cross border livestock trade flows in the peripheral territories of countries in the region is arguably a simple re-establishment of the longstanding indigenous pattern of extensive barter exchange and transboundary population migrations which predate colonial and post-colonial borders (Ogalo, 2010). The key motivational factors are both economic and social in nature, principally including entailed high transaction costs in the formal channel, poor access to formal export markets which are often controlled by the central elite (and often characterized by unfair transaction deals), and the strong prevalence of fraternalism and socio-cultural ties among pastoral communities that transcend artificial national borders. The overwhelmingly large infrastructural and personnel requirements of authorized flows and custom services along these extensive national borders also clearly necessitate *clean* ICBT activities to be conducted without adherence to the procedural requirements of formal institutions in the prevailing dismal conditions of poor infrastructure and inadequate institutional provisions of the centre (Desta et al., 2011; Little, 2009).

Informal cross border trade, officially considered as an illicit pursuit practiced in peripheral territories, is the least recognized vital economic activity of indigenously institutionalized longstanding tradition of informal regional integration in border areas of eastern African countries. The types of products traded in the ICBT operation of the eastern African region are quite diverse, but they generally include non-processed agricultural commodities, manufactured food and non-food stuffs, re-exports of low quality assorted goods of Asian origin, and other miscellaneous goods such as fuels and pharmaceutical products (Jean-Guy & Ajumbo, 2012). A distinctive element of the ICBT business in this region, as compared to conditions in many border

areas in the African continent, is the essential prevalence of live animal *outflows*. The informal cross border livestock flows in the pastoralist territories of the region, as typically explained by the transcontinental nature of movements of the traded products, is essentially intertwined with food and non-food basic commodity flows. Therefore, an important feature of the informal pastoral livestock export trading system is its corresponding import account of basic consumer goods *inflows*, a system which Umar and Baulch (2007) describe as a “set of parallel conveyer belts that take out livestock exports and bring in consumer goods”(p. 7).

ICBT activities are usually carried out under grave conditions of negative external interference often expressed in terms of army clampdowns, confiscations, harassments and various forms of abuse. However, ICBT is a vital source of income and employment for millions of actors. It is rather a coping mechanism and critical means of escaping poverty in the prevailing marginal conditions of scarce formal employment and income generating opportunities in the periphery. All the same, ICBT is considered by government officials as an illegal activity detrimental to national development goals. The peripheral herder societies, on the other hand, regard it as a normal system of transboundary exchange transactions vitally required for viable survival. The criminalization of ICBT operations as an illicit undertaking, especially in peripheral areas of Ethiopia, is historically defined by political and economic factors. It is partly associated with the tacit longstanding security concerns and scepticism of the centre over isolated pastoralist societies freely crossing national frontiers, an unfortunate unease which recently even more likely to have been heightened by threats of global terrorism and regional insurgents (Desta et al., 2011). Rather more obvious and a strong argument is the profoundly entrenched conventional belief of lost foreign exchange and central government revenues implied by the ICBT business. However, there are exceptions and the strict relevance of this conviction in the context of *our survey area* is quite questionable. The lack of methodologically robust systematic focus on adverse effects of the commonly observed surge of negative external interventions on the welfare of the peripheral poor is an important gap in the ICBT literature. Therefore, using an alternative methodological approach, this paper seeks to make a fresh contribution by trying to look at the issue of informal cross border trade from a

different perspective. It aims to cast some doubts on conventional perceptions that underlie hostile official interventions, especially by exploring the implied impacts of restrictive interference on the welfare of pastoral households based on our survey data of prevailing conditions in southern Ethiopian rangelands. It is believed that such a study will significantly contribute to the relatively understudied subject of informal cross border trade in Africa.

The remainder of the paper is structured as follows. We continue first to provide a general picture and critical account of the nature of informal livestock trade movements in border areas of southern Ethiopia. We then, in section 3, describe the basic model and data source with a further detailed discussion of the features of the pastoral village economy based on the estimated pastoral village social accounting matrix (SAM). The results of model simulation are discussed in section 4 and concluding remarks are given at the end.

2. A brief account of the nature of cross border pastoral livestock trading system

The arid and semi-arid Ethiopia-Kenya border areas are inhabited by mobile herder societies where seasonal cross border livestock movement as a rule is an integral part of the pastoralist production and trading systems. The organization of the pastoral trading system in peripheral areas is often characterized by i) a complex chain of several stages, ii) a set of market corridors and trading routes, iii) multiple actors and iv) elaborate indigenous networks of various informal support institutions. Detailed accounts of this magnificent traditional cross border trading arrangement are found in some illustrative studies of the vibrant transboundary traded animal movements in Ethiopia-Somalia borderlands in the Horn of Africa (for example, see Umar & Baulch, 2007; Mahmoud, 2010; Majid, 2010). The meeting points of market actors right on the doorsteps of pastoralist village encampments in the complex processes of price formations in the pastoral livestock trading system are the so called *bush markets* where traded animals are offered by pastoral households for sell to small traders or collectors. The next points of convergence are the *primary markets*, which are supplied by small traders

collecting animals from bush (village) markets scattered in the rangelands, and primary producers themselves, for sale to livestock traders, local butchers and breeders. A very important transit point in the supply chain is the *secondary market*. Secondary markets often serve as filtering points for classes of livestock of certain required characteristics which are either funnelled to *terminal markets* on the formal channel operated by big traders or to the *informal* routes which feed the cross border supply chain (see Appendix 1).

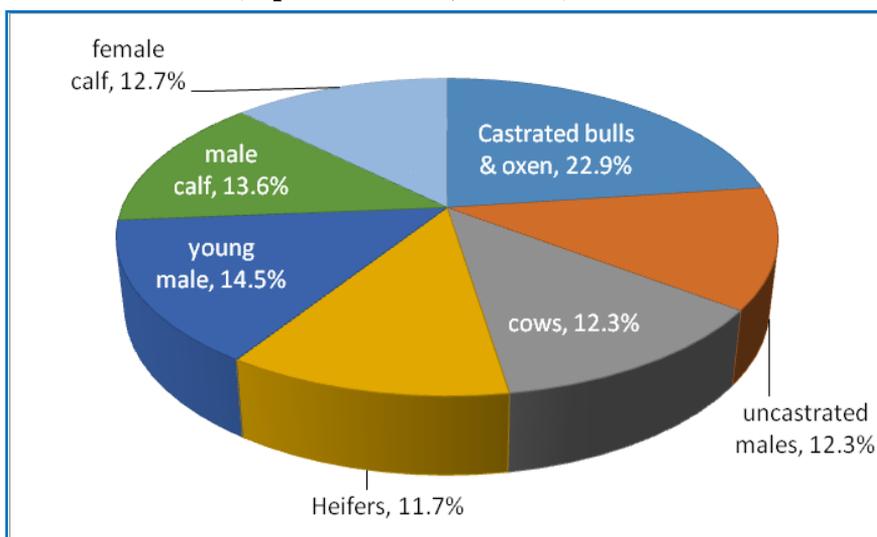
The major actors in the pastoral livestock informal cross border supply chain are producers, traders, brokers and trekkers. Hired trekkers, in particular, help in moving traded animals between rangeland livestock markets and across the national frontier in border areas. They especially play crucial roles in the often required special arrangements of trans-clan territorial border crossings in Ethiopia-Somalia border areas where the indigenous clan based institutional network is fairly directed to facilitate the entire conduct of the livestock trading operations in the area. This mechanism of clan based institutional networking of ICBT operations is less prevalent in Ethiopia-Kenya border areas where the indigenous social organization is typically different from that of Ethiopia-Somalia borderlands. Typically, the ICBT business is largely financed by informal credit institutions and financial transfer networks of kinships and related local affiliations (Gor, 2012), and is often crucially facilitated by vibrant *informal* foreign exchange markets in border areas. Incidentally, the fairly flexible parallel market exchange rate prevalent in Ethiopia-Kenya border areas, in addition to local demand and supply conditions, is fundamentally determined by movements in the formal market rates in Nairobi.

The ICBT subsector, which forms a significantly recognizable constituent element of the informal economy conventionally ignored in national accounts, is an important area of women involvement in Sub-Saharan Africa. Some reports indicate that the largest participants (70-75%) of the ICBT business, especially in western and southern Africa regions, are women (Masinjila, 2009; Njikam & Tchouassi, 2011). The level of involvement of women traders in cross border livestock operations in border areas of eastern Africa region is, however, greatly restricted by entry barriers chiefly associated with a

relatively large capital requirement of livestock trading. This has characteristically entailed the evidently observed condition of a more specialized involvement of women traders mainly as dealers in small stock species and cross border dairy marketing. All the same, the participation of women in informal cross border trade in livestock and livestock products is much more prevalent in Ethiopia-Somalia borderlands, where Somali women are very active in small stock marketing, than the virtually male dominated operational feature of cross border livestock marketing in Ethiopia-Kenya border areas.

The percentage composition of classes of cattle species supplied to the largest secondary market in Borana rangelands in 2012 is shown in Figure 2. The formal central export market can only absorb uncastrated males, which is quite below 15% of the total volume supplied by pastoral herders. The rest, except for the small percentage entering local abattoirs and young stock added back to pastoral herds, are castrated bulls, old cows, heifers and young animals (which account for more than 70%) would end up crossing the national border for ultimate destinations in cross border Kenyan markets. As depicted in Appendix 1, transboundary traded animal movements in Ethiopia-Kenya border areas are rather found to happen in both directions than a plain case of flows from Ethiopia to Kenya alone. Traded animal flows into Kenya are of the nature of unwanted classes of *cattle* species unattractive to the formal central Ethiopian export markets, and include castrated male, young male, old cows and young breeding stock. These animals are demanded in Kenya for direct slaughters, traction power, fattening and replacement stock in the subsistence dairy sector. The single most important cattle species demanded in the formal export channel are uncastrated bulls required for export to Middle East countries. Traditional pastoralists may often be compelled to adopt the practice of castrating male cattle, if not culled out early as marketed young stock, as part of their animal husbandry routines. However, there is no market outlet for this nonessential stock in pastoral herds except for the relatively attractive informal cross border export channel into Kenya.

Figure 2: Percentage composition of cattle supplied to Dubluk Livestock market (September-June, 2011/12)



Source: Dire district trade office

The corresponding informal cross border traded livestock inflows into Ethiopia, on the other hand, are camels and small stock species, which might ultimately form an important component of Ethiopia's livestock export supply to other countries. The pastoral areas in Kenya generally appear to have become an important source of required species for the previously less known but recently flourishing camel export trade in Ethiopia. Therefore, informal traded livestock flows in both directions are found to be quite beneficial for the two neighbouring countries. For Ethiopia, the attractiveness of the informal cross border market is quite unbeatable due to its demonstrated less fluctuating and relatively larger demand for different classes of cattle species. In contrast, the official central market channel is often characterized by its very selective quality standards, more susceptibility to demand fluctuations, and its branded features of massive credit-based transactions, periodic defaults and delayed payments for local traders.

3. Modelling the Pastoral Village Economy

3.1 The basic model

We consider a rural economy-wide model which in essence incorporates individual pastoral household response behaviour into a general equilibrium modelling framework of the rural economy (Taylor & Adelman, 1996; Taylor, Dyer & Nez-Naud, 2005). The starting point of this integrated modelling framework is the conventional notion of rural household utility maximization. Here individual pastoral households are assumed to maximize utility from the consumption of home-produced pastoral commodity (G^b), purchased goods (G^m) and leisure (G^l):

$$U = U(G^b, G^m, G^l, \Upsilon^h) \tag{1}$$

where U is a standard quasi-concave utility function and Υ^h is a vector of parameters of identifiable household characteristics. The utility function is maximized subject to (i) a budget constraint, (ii) production technology, and (iii) a time constraint, respectively:

$$\sum_i P_i^m G_i^m = P^b(Q - G^b) - w(L - F) + y_{tr} \tag{2}$$

$$Q = Q(L, \bar{K}) \tag{3}$$

$$T = F + G^l, \tag{4}$$

where Q is total output, w is local wage rate, L is labour used in pastoral production, F is total family labour supply to pastoral and non-pastoral activities, P^b is price of own pastoral output, P^m is price of purchased commodity, and y_{tr} is transfer income, which is from government, other pastoral households and external remittances. The budget constraint equates the value of marketed purchases to household cash income available from

marketable surplus proceeds ($Q-G^b$) plus net income from other sources. Labour (L) is assumed to be the main variable input applied to fixed capital (\bar{K}) inputs in production activities. The total time (T) available to the pastoral household is allocated to all labour activities (F) and leisure (G^l). The first-order conditions of this constrained optimization problem yields the well-known set of individual consumption and input demand functions.

Household behavioural decisions in the integrated local economy-wide modelling framework are assumed to yield rural general equilibrium solutions which are constrained by a set of conditions. The construction of village economy-wide models, which is intended to show heterogeneous rural households integrated into the local economy, is directed to merge the conventional farm household models with general equilibrium constraints (Holden, Taylor & Hampton, 1999). This is achieved by adding a set of constraints. The first of these rural general equilibrium constraints is the ‘material-balance’ equation of output market equilibrium:

$$Q_p = C_D + XM_D, \quad (5)$$

Where, Q_p = total output supply by pastoral households, C_D = household consumption demand, XM_D = local exports (X) minus imports (M) divided into sub-components of flows through formal and informal channels.

The second general equilibrium condition in the model is related to the required balance in the external accounts represented by the village trade balance of aggregate sum of formal and informal channel flows:

$$\sum_i P_{we} X_i + \sum T_{row} + S_f = \sum_i P_{wm} M_i, \quad (6)$$

Where, P_{we} = price of village exports, P_{wm} = price of imported goods, T_{row} = transfers from rest of the world, X_i = village exports, M_i = village imports, and S_f = village current account balance. The empirical analysis of the adopted village computable general equilibrium (CGE) modelling exercise is

essentially based on the structurally more elaborate model developed by Lögren, Harris & Robinson (2002). The pastoral village social accounting matrix (SAM) presented in Table 1 is used as a database to calibrate the model in order to obtain results of base run equilibrium.

3.2 The data

The estimated village Social Accounting Matrix (SAM) data framework used in this study was generated by a household level survey conducted in the Borana pastoral area of southern Ethiopia. The Borana pastoral area of southern Ethiopia is an important peripheral territory which form an extensive part of Ethiopia-Kenyan borderlands of a total border length of 861 kilometres. The survey area is inhabited by one of the well-known east African pastoral groups, Borana pastoralists, who also populate the arid areas of northern Kenya across the national frontier. The adopted method of data collection included pastoral household interviews, village business survey and key informant interviews.

The survey was conducted in 2013, in which a total of 141 randomly selected pastoral households were interviewed using structured tabular and verbatim questionnaires. These sample households were drawn from 4 survey sites of varied locations of arid and semi-arid areas of Borana rangelands, including a peri-urban site where crop cultivation has been fairly well adopted by pastoral households, in order to gain the required diversity in the selected sample. The randomly selected pastoral households, which were chosen by taking into account wealth status differentials, uniquely form a sub-sample of selected households in our designed periodic follow-up Borana pastoral livelihood research surveys of 2002 and 2012. In addition to pastoral household interviews, the present survey additionally embraced 25 village business entities, which included merchandize retailers and various sorts of food selling. The structured interview questionnaires were appropriately designed to generate annual data required for the estimation of the pastoral village SAM. Our key informant interviews, in addition to asking informed individuals about the cross border trade business, mainly focused on livestock traders, some of whom were carefully identified and approached to generate detailed information on the nature of informal cross border livestock trade flows.

3.3 The pastoral village Social Accounting Matrix (SAM)

This study uses a constructed SAM database for the Computable General Equilibrium (CGE) framework used to explore the implied adverse impacts of informal cross border livestock trade restrictions on pastoral household welfare in the selected peripheral region. A seminal work by Asmarom Legesse (Legesse, 1973, 2000) and subsequent investigations have brilliantly portrayed the exceptionally complex socio-cultural and traditional political structure of the pastoralist community in our survey area. We rather present a simple peripheral village economy partially integrated into the market mechanism. A consolidated pastoral village SAM is estimated based on data generated from survey of sampled sites in the study area. The rural village Social Accounting Matrix (SAM) is schematically designed to capture the flows and inter-linkages among village production activities, village institutions and the *outside world* (see Taylor & Adelman, 1996). The main structural features of the Borana pastoral village economy are presented in Table 1. The data on resource flows among village economic agents are assembled within a SAM framework which contains six categories of accounts (Activities, Commodities, Factors, Institutions, Saving-Investment and Rest of the World). The estimated data assembled within this SAM framework form the basis for exploring the implications of informal cross border trade shocks on the welfare of the peripheral poor. Disaggregated relevant interpretations of the estimated pastoral village SAM data in Table 1 are briefly presented below.

Table 1: Borana Pastoral Village Social Accounting Matrix (SAM) [Values in '000 Eth. Birr]

Activities	Activities		Commodities				Factors				Institutions				S-I			Rest of the World			Total
	1	2	1	2	3	4	5	6	1	2	1	2	3	4	ICBT	RowT	RoB				
1. Pastoralism			324.7	658.5							940.9	1128.3	1651.8							4,704.2	
2. Dry land Farming		4.5			136.2						88.1	78.6	112.3							419.7	
<i>Commodities</i>																					
1. Milk																	146.1		178.6	324.7	
2. Meat																	433.9	178.8	45.8	558.5	
3. Food & non-food											255.0	173.0	170.0						136.2	734.2	
4. Tea and sugar											99.5	58.7	51.0							209.2	
5. Furniture & utensils											9.1	6.7	12.7							28.5	
6. Prod & capital input	106.2	2.8													241.0					350.0	
<i>Factors</i>																					
1. Capital	1010	81.2																		1091.2	
2. Labour	3588	331.2																		3919.2	
<i>Institutions</i>																					
1. Poor households									205.2	776.2	10.6	28	355.7	34.3			11.2			1,421.2	
2. Middle households									283	1005	3.4	9.8	171.5	24.1			15.3			1,512.1	
3. Rich households									603	2138	1.6	4	24.6	1.3			26.7			2,799.2	
4. Government					10.1	1.6	1.4				3.4	4	39.2							59.7	
<i>Capital account (S-I)</i>																					
											9.6	21.0	210.4							241.0	
<i>Rest of the world</i>																					
1. INF cross border T					480.6	80.4	27.1	45.1												533.2	
2. Formal ROW T					35.2	127.2		16.4												178.8	
3. Rest of Borana					72.1			288.5												360.6	
Total	4704.2	419.7	324.7	658.5	734.2	209.2	28.5	350.0	1091.2	3919.2	1421.2	1512.1	2799.2	59.7	241.0		633.2	178.8	360.6		

Village production activities and value-added

The consolidated village SAM (Table 1) shows two major activities (*pastoralism* and *dryland farming*) currently practiced by the herder community in the survey area. An estimated 92% of production value-added in the village economy is contributed by traditional pastoralism. Pastoralism is the core economic activity practiced by traditional livestock herders on communal pasturelands in this dryland environment where sustainable crop-based livelihoods are infeasible due to aridity and erratic natural conditions. The traditional Borana pastoralists in the study area raise cattle, sheep, goats and camels mainly for subsistence milk production, and beef off-take for supplementary procurement of non-pastoral commodities. The cattle enterprise is the most favoured one of complete social function in the Borana pastoralist herd species portfolios (see Behanu, Colman, & Fayissa, 2007). The village SAM is constructed with an important consideration that the pastoral household economy is characterized by production for home consumption and sale. Past internationally financed rangeland development programs had their core aims focused on livestock commercialization with a view to increase pastoralist market integration. Data in the consolidated village SAM rather reveals that only about 21% of the pastoral output passes through the market. Beef off-take accounts for the largest proportion (67%) of marketed livestock products supplied by the pastoral village economy. It is consistent with the 'milk-subsistent' feature of Borana pastoralist production system in which the estimated expenditure share of meat is only about 4% of pastoral household budgets (Behanu, 2011a).

Household income and expenditure

The flow of income from factor services and transfer payments to pastoral households is recorded in the institutional account of the pastoral village SAM in Table 1, which includes household institutions and government. The institutional accounts, in addition to distribution of value-added among pastoral household groups and inter-household transfers, further summarize household receipts from government transfers and remittances from rest of the world. The percentage breakdown of total institutional income by source is summarized in Table 2. The distribution of value-added in the village

economy is such that the rich group of household (18% in the sample) received 55% of total factor income flows from village production activities. The overall average annual institutional income receipt per capita was birr 6550.5, with a range of birr 3525 per capita for the poor and birr 11899.1 for the rich.

Table 2: Percentage distribution of institutional income by source of origin and household group

Source of Income	Percentage share in institutional income sources		
	poor	Middle	Rich
Village production value-added	19.6	25.7	54.7
Inter-household transfers	64.7	30.3	5.0
Government transfers	57.4	40.4	2.2
Remittance	21.0	28.8	50.2
	Income per capita by household group		
Annual Income per capita (Birr/person)	3525	6396.6	11899.1

Source: computed from survey data

The observed inequality in the distribution of factor incomes, fundamentally driven by individual household level of *capital* factor endowments, is to some extent partly smoothed out by the indigenous institution of income (asset) transfers. Table 2 shows that about 65% of inter-household transfers are received by poor households, which include cash and in-kind transfers. The pastoral community in the survey is typically characterized by the existence of a fairly robust system of indigenous welfare and social support mechanisms. The rich, by the traditional constitution, have the obligation to restock the needy through regular asset contributions to the prevailing wealth redistribution schemes of the system (Behanu, 2011b). Here it is quite instructive to compare the percentage distributions of government and local inter-household transfers among social groups. The relevant entries in the estimated village SAM reveal that institutionalized indigenous inter-household transfers are almost 9 times more than the recorded government transfers implemented through currently on-going safety net social protection programs. Government transfers, perhaps with the potential

to crowd out the indigenous institutionalized transfers, are operationally often of intermittent flows and inevitably of unsustainable nature. The comparatively high share of middle wealth group in government transfers indicates the general tendency of the possibility of some level of poor targeting in government social protection programs. Furthermore, the share of inter-household transfer receipts by middle and rich households indicated in Table 2 usually predominantly refer to gifts offered by all household groups during ceremonial occasions.

The expenditure side of the pastoral village SAM in Table 1 presents the flow of household income into spending on village and imported products consumption, payments for indigenous social welfare obligations and local government direct taxation. The aggregate household consumption demand in the village economy is satisfied through home production and commodity imports. Table 3 presents the percentage distribution of imported consumption shares in pastoral household budgets. The overall share of imported consumption in total pastoral household expenditure is estimated to be 15%. Imported consumption spending constitutes the largest part of the *cash* component of pastoral household budget, and the indicated percentage shares for item number 1 in the fourth row of Table 3 essentially reflect the very significantly larger predominance of in-kind consumption shares of subsistence production. In percentage terms, the cash component of pastoral household consumption expenditure is inversely related with wealth status among our traditional pastoralist society, in that the largest component of in-kind consumption of own produced food (milk and meat) was observed for the rich group. High milk deficit poor households are often forced to generate cash income through non-pastoral activity participation such as petty trade, charcoal making and fuel wood selling in order to procure cereal grain and the basic survival items of sugar and tea required for the preparation of white tea as their regular essential diet.

Table 3: Percentage distribution of imported consumption share by household and commodity group

Item	% distribution of imported consumption			
	Poor households	Middle households	Rich households	Total
1. Share in total consumption budget	26.1	16.5	12.0	15.0
2. Share by commodity group				
Food & non-food basics	42.6	28.9	28.5	100
Tea & sugar	47.5	28.0	24.5	100
Furniture & utensils	31.9	23.5	44.6	100

Source: computed from survey data

The village external accounts

The pastoral village economy, though heavily reliant on livestock rearing with limited level of economic diversification, is fairly an open system increasingly exposed to the pressures of change in the external environment. The external trade transactions of the pastoral village economy is recorded in the *Rest of the World* account of the village SAM, here divided into three sub-accounts of Informal Cross border Trade (ICBT), Formal Rest of the World (RowT) and Rest of Borana (RoB). Pastoralists produce a tradable commodity (livestock) of complex composition of considerably promising international and domestic market demands. Here, a computed average of 77.2% of the estimated *marketed* component of village production (milk and meat) is exported to other countries both through the formal and informal channels. An important result of our village SAM estimation is that about 71% of the total value of live animal export from the region is traded though the *informal* cross border trade channel. Quite notably, for the fairly “borderless” mobile pastoral community, making use of either the formal or informal channel is a matter of absolute convenience and comparative economic attractiveness rather than one of legality or legitimacy. The estimated value of imported commodity demand is 23% of the gross annual value of village production, and an estimated 78% of consumer goods and basic productive input inflows from outside the region were found to take place through the *informal* cross border trade channel. The observed large percentage shares of informal cross border flows show that the peripheral pastoral economy is more integrated into the cross border Kenyan markets rather than the central Ethiopian market.

3. Simulation Results

We set up three experimental scenarios in order to generate broadly indicative simulation results intended to help us explore the implied impacts of informal cross border livestock trade bans on pastoral household welfare. These are experimental scenarios which basically signify the level of pastoral livestock export reduction associated with the degree of shocks required to prevent outflows through both the formal and informal channels. The first of these scenarios refers to an extreme case of 70% reduction, which is roughly an equivalent of a complete blockage of informal cross border outflows. This is in accordance with our estimated minimum of the size exported from the region through the informal cross border trade. The second experimental scenario (30% reduction) represents a plausible case of a complete import ban by formally importing countries in the Middle East but free informal cross border flows. Transnational formally traded live animal movements are typically subject to rigorous safety regulations necessitated by sensitive international health concerns. These health related restrictions in live animal exports appear to have increasingly become even more stringent in the major importing countries of the Middle East due to rising international tourism and growing transnational business interests in the region (Majid, 2010). Formal livestock import bans often come from Saudi Arabia, which is the biggest market for live animal exports from the Horn of Africa. The effects of these shocks, fundamentally transmitted through widespread abysmal declines in livestock prices, on the purchasing power and food security of pastoralist societies in the Horn region could be very damaging, which has become evident from the previously observed case of some instances where traditional herders were forced to resort to alternative sources of income such as charcoal making and food aid (FEWS NET, 2010). A greatly more damaging similar effect is also expected from severely restrictive regular government interference in the informal cross border channel. The last fairly plausible medium level scenario is represented by a complete ban of formal export outflows plus a 25% reduction in the informal cross border trade. These alternative scenarios generally imply reductions in the total value of animal exports from the region, which principally imply substantial drops in pastoral household income and imported consumption.

Table 4: Impacts of cross border livestock trader restrictions on pastoral household income

Household group	Base (income) ('000birr)	Experimental Scenario 1 (70% reduction)		Experimental Scenario 2 (30% reduction)		Experimental Scenario 3 (55% reduction)	
		Change ('000 birr)	%	Change ('000 birr)	%	Change ('000 birr)	%
		Poor households	1020.4	748.1	-26.7	877.5	-14.0
Middle households	1318.7	961.5	-27.1	1131.4	-14.2	1027.7	-22.1
Rich households	2750.3	1988.0	-27.7	2350.6	-14.5	2129.3	-22.6

Source: results of model simulation based on survey data

Simulation results reported in Table 4 indicate the negative impacts of cross border livestock trade restrictions on pastoral household income. As expected, a complete loss of informal cross border livestock trade revenues would imply a negative impact on pastoral household income twice the size of implied welfare loss inflicted by a total ban suffered in the formal live animal export channel. Formal live animal export bans typically result in considerable drops in livestock price levels and significant deterioration in pastoral terms of trade due to significant decline in demand. The adverse impact of severely restrictive government interference in the informal cross border channel is rather significantly harsher due to the sheer volume of trans-boundary traded animal movements and lack of alternative outlets. The results in Table 4 show that, though it is slightly higher for wealthy stock owners, the effect is generally similar for all groups of pastoral households. Results reported in Table 5 indicate that the impact of informal cross border livestock trade restrictions is considerably higher in terms of simulated drops in household imported consumption. The resulting impact is more than 50% larger (than that of simulated drop in household income), and is generally bigger for wealthier households.

Table 5: Impacts of livestock trader restrictions in term of changes in imported consumption

Household group	Base (income) ('000birr)	Experimental Scenario 1 (70% reduction)		Experimental Scenario 2 (30% reduction)		Experimental Scenario 3 (55% reduction)	
		Change ('000 birr)	%	Change ('000 birr)	%	Change ('000 birr)	%
		Poor households	329.7	196.3	-40.5	254.2	-22.9
Middle households	285.9	170.2	-40.5	220.5	-22.9	188.8	-34.0
Rich households	434.5	232.2	-46.6	320.8	-26.2	265.2	-39.0

Source: results of model simulation based on survey data

Overall, results of the established simulation scenarios generally portray a broad picture of the expected adverse impacts of livestock trade bans on pastoral household welfare, with equally considerable negative effects on poor and wealthy households. This signifies a case of possible significant welfare gains at the household level that can be achieved from free informal cross border flows and improved production and marketing conditions directed to obtain better returns from the formal livestock trade channel. It is quite evident that Borana pastoralists, under the prevailing conditions of their animal husbandry practice and culling calculations, if forced, may prefer the choice of a complete loss of the formal channel in favour of the informal crossborder option. In the case of the formal central market export channel, conventional wisdom and associated program designs generally tend to focus on issues of marketing and infrastructural bottlenecks. All the same, the formal livestock export channel is not only limited by problems of infrastructural services and key marketing constraints, but it also requires an additional venture of a search for the possibility of fine tuning efforts in market oriented animal production and culling practices of pastoralist producers.

4. Concluding Remarks

Informal cross border livestock trade is an integral part of indigenous institutions of trans-boundary socio-economic relationships among pastoralist societies in eastern Africa. Its trading routes and international outlets have ultimately developed into an export-import channel of trans-continental trade embracing parts of Asia. ICBT is a normal economic activity of immediate resort and source of livelihood for millions of inhabitants in peripheral territories of many countries in Africa. Nevertheless, despite its sheer size and enormous contributions, the complex case of trans-boundary informal economic interactions is not a serious concern of affirmative action by national governments, most notably because of lack of positive recognition. It is a serious subject which should be positively considered in national strategies and formal discussions concerned with the long-term goal of regional economic integration in Africa. The features of this trade, in terms of the type and direction of commodity flows as well as the character of indigenous institutional support mechanisms, are generally quite diverse both within individual countries and across the continent. This paper is rather set out to examine the case of informal cross border traded livestock movements in Ethiopia-Kenyan borderlands with a view to clear some doubts on conventional perceptions that underlie hostile official interventions, and broadly explore the implied impact of these restrictive actions on the welfare of the peripheral population.

The conflicting aims of household level food security and general welfare of the peripheral poor as against the official claim of loss of foreign exchange and national revenues are central to core arguments surrounding the micro versus macro policy quandary of informal cross border livestock trade restrictions in frontier regions of Ethiopia. However, this should rather be examined case by case and, from the prevailing circumstances of the study area, it is quite difficult to uphold the familiar case of conventional narrative about foreign exchange loss as a strong justification for hostile interference in the cross border traded livestock movements of the region. The ICBT in the study area rather appears to be equally beneficial to the two neighbouring countries both as a source of income and local food security for the peripheral populations as well as foreign exchange earnings at the national level.

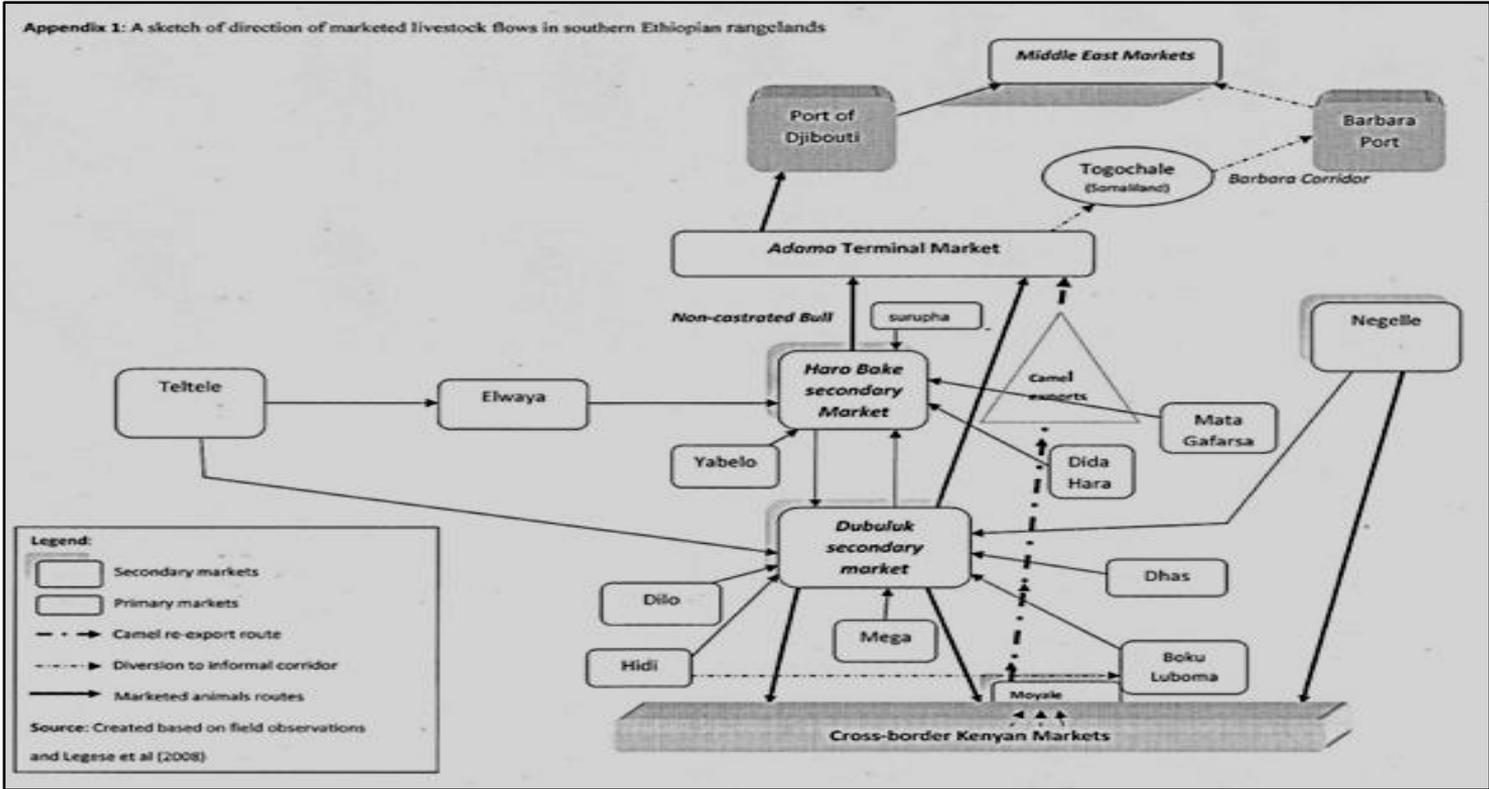
In the context of the study area, while the justifications for heavy-handed government interference in the ICBT channel to a large extent appear to be trivial, the burden of impact of this effort on the welfare of the peripheral population is inevitably quite tremendous. Our simulated model results of alternative scenarios of reduction of live animal export from the region consistently indicate that cross border livestock trade restrictions would predictably imply substantial drops in pastoral household welfare. The adverse effect of severe ICBT restrictions is apparently more painful for the peripheral population than that of the formal trade ban occasionally imposed by importing countries in the Middle East. Therefore, it does not seem worthwhile of making an effort to block the ICBT channel, which is generally characterized by a fairly established demand for classes of livestock species discarded by the formal channel and broadly less stringent in its required quality standards. Government efforts directed to maximise foreign exchange and internal revenues generated from traded livestock from the region should rather focus on provision of effective pastoral extension, improved husbandry practices, enhanced veterinary and infrastructural services, and removing key marketing bottlenecks that constrain effective operations of the formal channel. The cross border livestock trade operation in Ethiopia-Kenyan border areas should, therefore, unfailingly be based on the principle of free flows fundamentally lubricated by transboundary mutual cooperation between governments of the two countries in areas of relevant marketing infrastructure provision and effective animal health services.

References

- Behanu, W. (2011a). The Household Economy and Analysis of Expenditure Patterns of Borana Pastoralists in Southern Ethiopia. *Ethiopian Journal of Agricultural Economics*, 8, 37-73.
- Behanu, W. (2011b). Shocks, Poverty Traps and Degradation of Pastoralist's Social Capital in Southern Ethiopia. *African Journal of Agricultural and Resource Economics*, 6, 1-15.
- Berhanu, W., Colman, D., & Fayissa, B. (2007). Diversification and Livelihood Sustainability in a Semi-Arid Environment: A Case Study from Southern Ethiopia. *Journal of Development Studies*, 43, 871-889. DOI: 10.1080/00220380701384554
- Coppock, L. (1994). *The Borana Plateau of Southern Ethiopia: Synthesis of Pastoral Research, Development and Change*. Addis Ababa: ILCA.
- Desta, S. W. Behan, A. Sebsibe, A., & Guerne Bleich, E. (2011). Assessment of Cross Border Informal Livestock Trade in Somali Region, Main Report. FAO Regional Initiative in Support to Vulnerable Pastoralists and Agro-Pastoralists in the Horn of Africa, Food and Agricultural Organization of the United Nations. Unpublished Manuscript.
- FEWS NET. (2010). Cross border Livestock Trade Assessment Report: Impacts of Lifting the Livestock Import Ban on Food Security in Somalia, Ethiopia, and the Djibouti Borderlands. Retrieved from: http://www.fews.net/sites/default/files/documents/reports/east_Cross%20border_2010_10_final.pdf
- Gor, S. (2012). An Assessment of the Informal Sector Trade in Kenya. *The Estey Centre Journal of International Law and Trade Policy*, 13, 102-114.
- Holden, S. E. Taylor and S. Hampton. (1999). Structural adjustment and market imperfections: a stylized village economy-wide model with non-separable farm households. *Environment and Development Economics Issue*, 1, 69 – 87.
- Jean-Guy, A. and G. Ajumbo. (2012). Informal Cross Border Trade in Africa: Implications and Policy Recommendations. AfDB Africa Economic Brief 3(10) (November).
- Legesse, A. (1973). *Gada: Three Approaches to the Study of African Society*. New York: Praeger Publishers.
- Legesse, A. (2000). *Oromo Democracy: An Indigenous African Political System*. Lawrenceville, NJ: Red Sea Press.

- Legese, G., Teklewold, H., Alemu, D. & Negassa, N. (2008). Live Animal and Meat Export Value Chains for Selected Areas in Ethiopia: Constraints and Opportunities. Retrieved from: <https://cgspace.cgiar.org/handle/10568/256>
- Little, P. (2007, March). Unofficial Cross border Trade in Eastern Africa. A Paper presented at FAO workshop on “Staple Food Trade and Market Policy Options for Promoting Development in Eastern and Southern Africa”. Rome.
- Little, P. (2009). Hidden Value on the Hoof: Cross border Livestock Trade in Eastern Africa. COMESA Policy Brief Number 2, February.
- Lögfren, H. R. L. Harris, and S. Robinson. (2002). A Standard Computable General Equilibrium (CGE) Model in GAMS. Microcomputers in Policy Research 5, International Food Policy Research Institute (IFPRI).
- Mahmoud, H. (2010). Livestock Trade in Kenyan, Somali and Ethiopian Borderlands. Chatham House Briefing Paper, September.
- Majid, N. (2010). Livestock Trade in the Djibouti, Somali and Ethiopian Borderlands. Chatham House Briefing Paper, September.
- Masinjila, M. (2009). Gender Dimensions of Cross Border Trade in the East African Community - Kenya/Uganda and Rwanda/Burundi Border. ATPC Work in Progress No. 78, Economic Commission for Africa.
- Njikam, O. and G. Tchouassi. (2011). Women in Informal Cross border Trade: Empirical Evidence from Cameroon. *International Journal of Economics and Finance*, 3, 202-213. doi:10.5539/ijef.v3n3p202
- Ogalo, V. (2010). Informal Cross-Border Trade in EAC: Implications for Regional Integration and Development. CUTS International, Research Paper.
- Umar, A. and B. Baulch. (2007). Risk Taking for a Living: Trade and Marketing in the Somali Region of Ethiopia. UN OCHA-PCI, Addis Ababa, Ethiopia.
- Taylor, E. G. Dyer and A. Yu´ Nez-Naud. (2005). Disaggregated Rural Economy wide Models for Policy Analysis. *World Development*, 33, 1671–1688. doi:10.1016/j.worlddev.2005.05.003
- Taylor, E. and I. Adelman. (1996). *Village Economies: The design, estimation and use of village wide economic models*, Cambridge University Press, New York: USA, Melbourne: Australia.

Appendix 1: A sketch of direction of marketed livestock flows in southern Ethiopian rangelands



Trade Reforms, Mark-Ups and Bargaining Power of Workers: The Case of Ethiopian Manufacturing Firms¹

Worku Gebeyehu

Abstract

There is a predominant proposition in trade theory that firms operating in an imperfect market with trade barriers often set prices with a positive mark-up. Workers using insider information tend to bargain and share the rent from firms' market power; which is negatively associated with to decline with trade reforms. Empirical evidences are, nonetheless, mixed. Trade reforms that took place between 1991 and 2002 in Ethiopia inspired the study to investigate the proposition. Using firm level unbalanced data of manufacturing firms employing more than 100 permanent workers between 1996 and 2007, a model of mark-up with labor bargaining power was estimated using random effects and LDPDM. The estimates of the two models are similar. Albeit huge inter-firm variations, the average estimated mark-ups has not only been positive but also increased even after the reform. This may be perhaps because of the 17.5 percent weighted average tariff rate that has still been maintained after the reform. Workers' bargaining power parameter estimate remained negative over the study period; possibly because of high unemployment and low reservation wage. The rate of rent extraction from workers declined on average in the post reform period. Thus, further opening up of markets may bring a competitive push to improve firm performance, reduce market power of firms and the rent extraction from workers. There is a need to attract additional investment (both public and private) in the economy and addressing causes of capacity underutilization of incumbent firms may lessen unemployment problems and thereby improve workers bargaining power and their earnings.

Keywords: Trade reform, mark-up, bargaining power, rent, trade unions

¹ Worku Gebeyehu (PhD), Department of Economics, Addis Ababa University. The author wants to acknowledge the contribution of the two anonymous reviewers of this article and also Dar es Salaam University and African Economic Research Consortium.

1. Introduction

The period between 1974 and 1991 was characterized by high level of protectionist policy and socialist economic management in Ethiopia. The country undertook policy reforms between 1991 and 2002 including reducing the weighted average tariff rate from 41.6 percent to 17.5 percent, the tariff band from 23 to 6 and the maximum tariff rate from 230 percent to 35 percent respectively [MOFED, 2008] that was intended, among other things, to improve the performance and competitiveness of local industries. Trade reforms may bring both negative and positive effects on employment and wages. Neglecting the negative consequences of trade is very detrimental to society as its potential benefit is generally small for a large number of people but it can hugely cost small groups of individuals [Gürtzgen, 2002].

Trade openness increases mobility of capital and superior quality intermediate inputs which can partly substitute the services of labor [Rodrik, 1997]. It increases both price elasticity of demand for goods and labor demand [Slaughter, 2001]; which in turn, affects bargaining power of workers to secure their job and improve their wage. The response of firms to trade reforms is heterogeneous depending, for instance, on their productivity and market orientation [Melitz, 2003 and Melitz and Ottaviano, 2008]. Productive firms tend to improve the reward for factor inputs; whereas inefficient firms cut back production or exit out of the market and affect employment and wages.

A number of studies evidenced that wage responses are greater than employment following trade liberalization because of labor market rigidities for possible reallocation [Hoekman and Winters, 2005], which requires to give more emphasis to study the effect of trade reforms on wages. A positive association was observed between trade barriers and wages in the works of Gürtzgen (2002), Mezzetti and Dinopolos (1991) and Huizinga (1993). Goldberg and Pavcnik (2005) find workers operating in more protected sectors earn larger than those in more open sectors with similar observable characteristics, in the case of Colombia. On the contrary, Fisher and Wright (1999) find a negative relationship between wages and protection.

The amount of fair wage expectation and the interest to work with depends positively on the level of firm's productivity [Egger and Kreickemeier, 2009]. Workers, with secured job, may share rent with firm owners arising from imperfect markets with entry barriers. Such opportunity for workers arises because of labor market imperfection due to heterogeneity in skills; experience and motivation of workers. Trade openness erodes this rent [Rama, 2003] in [Hoekman and Winters, 2005] and may negatively affect workers in import-substituting firms as against exporting firms [Greenaway et al. 1999].

Trade unions (TUs) play a key role for workers to get a premium over what marginal conditions' wage rate warrants. TUs have a relatively long history in Ethiopia. There are however some restrictions on their establishment [Aidt and Tzannatos, 2002]. TUs in state owned enterprises are often represented in the board to influence firms to properly consider the working and payment conditions of workers. TUs in the private sector also bring issues to the attention of the management of firms or request government to arbitrate their cases.

In spite of the presence of TUs, workers' wage is likely to be lower than their marginal revenue product, let alone involve in rent sharing because of limited alternative job opportunities for bargaining. The competitive push in the goods market because of economic reforms is to have depressing effect on mark-up, bargaining power of workers and amount of rent.

Whether there firms used to charge visible price mark-ups and share part of the rent to workers before and during trade reforms and what changes have been observed in this regard afterwards are questions that need to be addressed. Theories and empirical evidences elsewhere and the situations in the Ethiopian manufacturing sector lead to two testable hypotheses: (i) firms' were able to obtain mark-ups; whose magnitude declines in the post reform because of loss of market power and (ii) firms do not share a rent with their workers given weak bargaining power of the later.

The aim of this paper is, therefore, to estimate firm mark-ups and the share of rents accruing to workers and how much it has changed between "during" and "post" trade reform periods. To this effect, the paper jointly estimates firm

mark-up and workers' bargaining power parameters and assesses the change in magnitude between the two trade regimes and across groups of firms.

The study used panel data of manufacturing firms that employ 100 or more permanent workers² between 1996 and 2007 drawn from Central Statistical Agency of Ethiopia. Linear Dynamic Panel Data Method (LDPDM) was applied to obtain coefficients that are used to calculate mark-up and bargaining-power parameters. Mean and median equality tests were used to check the validity of hypotheses using STATA 12.

To the knowledge of the writer, this is the first attempt in the context of Ethiopia at the very least and one of the few attempts made in the context of developing countries. Thus, it may lend some policy implications and modest contribution to literature on how rents are distributed between firms and workers and whether trade reforms affected the pattern of distribution.

The remaining part of the paper is organized as follows. Section 2 reflects some of the theoretical and empirical literature on mark-up and rent sharing. Section 3 portrays the theoretical framework and estimation strategy of the study. Section 4 discusses estimation results and Section 5 concludes with some implications for policy.

2. Literature Review

2.1 Theoretical Literature

In an imperfect labour market, workers' pay may tend to deviate from the marginal conditions of the classical competitive markets. The risk-averse model postulates a positive association between wages and profits because of uncertainty [Blanchflower, et al. 1996]. Workers may have insider sufficient information on the level of profit and exert pressure through their TUs to have a share. Sometimes firms face product demand shock and upward sloping labor supply curve that may cause a temporary positive correlation between

² This is simply because of the higher likelihood of these enterprises to have TUs as against smaller firms with fewer than 100 permanent workers. The study used a unbalanced panel data with a total of 1663 data points ($N \times T$).

wages and profits in the short-run [Goos and Konings, 2001]. Such imperfections force workers and firms to involve in negotiation to set wage premiums.

Theories provide different channels through which workers' negotiation power and wage rates may be affected following trade reforms. Built based on the assumption of monopolistic competition in the goods market and possibility of bargaining in the labor market, the macroeconomic model predicts that market deregulation lowers prices of goods and raises real wages but at the same time reduces mark-ups and the rent that goes into workers because of bargaining [Blanchard and Giavazzi, 2003].

Heterogeneity in firm performance after trade reforms becomes a source of wage inequality. Inefficient firms either pay lower wages or lay off their workers, whereas workers in productive firms benefit from higher returns [Egger and Kreckemeier, 2009].

2.2 Empirical Evidence

Empirical evidences on the impact of trade openness on wages and the bargaining power of workers is mixed. As documented in Goldberg and Pavcnik (2007), Feliciano (2001) for Mexico and Pavcnik, et al. (2004) for Brazil find no association between trade liberalization and wage premium. Goldberg and Pavcnik (2004) find both positive and negative association in the case of Colombia attributed to skill differences. Mishra and Kumar (2005) find a negative association for urban India.

Crépon et al. (1999, 2002) in Boulhol et al. (2007) argue that estimations based on perfect competition in the labor market might give a misleading result about wages. They found, using a model that consider imperfect product and inputs market, a bargaining power estimate of about 0.66 associated with higher mark-up of the firms. Dobbelaere (2004) also indicated how ignoring imperfections in the labor market leads to underestimation of mark-up among Belgian firms. Actually he found heterogeneous mark-up and bargaining power parameter estimate. López and Gallardo (2006) also found an imperfect

labour market in Mexico influenced by wage-bargaining and insider-outsider models. Workers in productive firms get greater proceedings than otherwise.

Brock and Dobbelaere (2006) found little evidence on the impact on the workers' bargaining power using fixed effects model and a separate equation for wage bargaining as against Boulhol et al. (2007), who found a significant drop on both mark-up and workers bargaining power using GMM as a response to globalization.

Using Olley and Pakes (1996) method to correct simultaneity bias in the first stage and fixed effects in the second stage, Abraham et al.(2009) jointly estimated mark-up and bargaining power parameters and find a positive association between the two and also firms facing high import-penetration to have lower estimated values for both parameters in the case of Belgian manufacturing firms. Using French firms, Dobbelaere and Mairesse (2009) found large values for both union bargaining and firm mark-up. The study also found firm and industry heterogeneity in the size of mark-up and rent-sharing parameters.

Moreno and Rodríguez (2009) assumed constant returns to scale in their model and used Roeger (1995) strategy to address endogeneity problems associated with total factor productivity on a panel of Spanish firms and come up with a positive association between workers' rent sharing parameter and firms' mark-up and negative correlation between these parameters and imports of final goods.

2.3 Nature and Role of Trade Unions in Ethiopia in Wage Fixing

Trade Unions may be established in an enterprise with twenty or more workers. Freedom of organization of workers applies if it conforms to national security, public safety and economic well-being, health or morals and also involvement of country's political affairs (FDRE: Proclamation 42/1993, 88/1994 & 377/2003). It is indicated that

“Employers owe remuneration to workers for work performed according to contracts of employment. Wages are set either on

individual contract or through collective agreements. ... Collective bargaining is an important feature of industrial relations in Ethiopia although a very negligible percent of the labor force which is less than 15% is covered by it” [Bersoufekad, 2003, 13-15].

Formation of TUs has a fairly long history in Ethiopia. Confederations of Ethiopian Trade Unions (CETU) were established in 1963; which constitute 9 trade union federations in 2012 with members between 350,000 and 400,000 [Goldberg, 2012]. The bigger the firm and the number of workers, the higher the likelihood of facing workers pressure to form TUs and so do for firms to respect the labour laws. Formation of TUs is seriously challenged by small-sized private firms. Thus, this study considered firms that employed 100 or more permanent workers are likely to have TUs and thus constitute as subjects of analysis.

Firms with TUs put in place a bi-law designed based on workers’ collective bargaining with their employers that state the rights and obligations of both parties and on how they jointly maintain industrial peace. The bi-law contains wages, incentives and payment modalities, working conditions, fire and hire procedures and circumstances leading for lawful absence of work and similar closes. Conflicts between the two parties are brought to a tripartite committee drawn from CETU, Ethiopian Employers Federation and government that meets on a bi-monthly basis or to the court if the committee’s decision is not accepted by either the party. This indicates the role of TUs in wage bargaining; albeit workers still complain about low payment, job insecurity and delays of judicial institutions [CETU, 2011].

3. Methodological Framework

3.1 Theoretical Framework

The neoclassical economics indicates that profit maximizing firm will increase the level of employment of a variable input until the marginal revenue product (MRP) of that input equals what it is paid off. This condition inherently presumes perfect divisibility, homogeneity and free mobility or perfectly elastic input supply. TUs or insider workers’ influence, regulations

and other sources of labor market rigidities do not also exist. In practice, payments are not made based on marginal conditions. Considering this, the paper introduced imperfect labor market condition in the Hall (1988) mark-up equation model following Blanchard and Giavazzi (2003), Crépon et al. (2002) as applied in Dobbelaere (2004), Boulhol et al. (2007), Abraham et al. (2009) and Dobbelaere and Mairesse (2009) to capture the possibility of organized workers' influence on firms' wage setting in the context of Ethiopia.

Assuming a typical production technology of firm i at time t to be characterized by:

$$Y_{it} = A_{it} F(L_{it}, M_{it}, K_{it}) \quad i = 1, \dots, N \quad \text{and} \quad t = 1, \dots, T \quad (3.1)$$

Where, Y_{it} , L_{it} , M_{it} , and K_{it} are output, labor, material and capital inputs respectively. A_{it} i and t are *TFP*, firm and time identification parameters.

Taking the derivative of the natural log of (3.1) with respect to time and making some algebraic manipulations gives

$$y_{it} = \beta_{L_{it}} l_{it} + \beta_{M_{it}} m_{it} + \beta_{K_{it}} k_{it} + a_{it} \quad (3.2)$$

Where, y_{it} , l_{it} , m_{it} , k_{it} and a_{it} are rates of growth of output, labor, material, capital and TFP respectively.

In perfectly competitive markets and constant returns to scale, the elasticity of output with respect to each factor input ($\beta_{V_{it}}$, where $V = L, M, K$) is equal

$$\alpha_{V_{it}} = \frac{w_{V_{it}} V_{it}}{P_{it} Y_{it}},$$

its corresponding cost share from total revenue of the firm or

where $w_{V_{it}}$ are the prices of factor input (V_{it}) and P_{it} are the prices of output (Y_{it}).

Relaxing the assumption of perfect competition in input and product markets, the short run profit maximization condition of the firm gives

$$\beta_{Lit} = \mu_{Lit} \alpha_{Lit} \tag{3.3}$$

$$\beta_{Mit} = \mu_{Mit} \alpha_{Mit} \tag{3.4}$$

$$\mu_{Lit} = \mu_{Mit} = \mu_{it} \tag{3.5}$$

Equations (3.3) and (3.4) imply that firms pay for inputs after adjusting their MRP by a certain magnitude μ_{Lit} or μ_{Mit} . Based on (3.2) returns to scale of a firm (θ_{it}) and the coefficient of capital can be written respectively as:

$$\theta_{it} = \beta_{Lit} + \beta_{Mit} + \beta_{Kit} \tag{3.6}$$

Using (3.5) and (3.6), (3.2) can be written as:

$$(y_{it} - k_{it}) = \mu_{it} [\alpha_{Lit} (l_{it} - k_{it}) + \alpha_{Mit} (m_{it} - k_{it})] + [\theta_{it} - 1]k_{it} + a_{it} \tag{3.7}$$

Equation 3.7 enables to run away from the need for computing user cost (or price of capital) and resulting cost share of the capital input for estimation.

The assumption of the above model is further relaxed to include the role of TUs in influencing wage setting behavior of firms (supported by rules or regulations governing certain incentive schemes and arbitration mechanisms). Unlike the standard model of union bargaining, this paper assumes, based on specific conditions of a small developing country; TUs attract lower number of members among workers of a given firm.

Members contribute membership fee, which has an insignificant share from their wage. TUs discuss with firms' managers about wages, overtime payments, bonus or other incentives. Management knows that failure to

address this request may result in collaborative shirking of efforts that may lead to the extent of an open strike. It also knows that joining to TUs may only need to pay a small membership fee at any time; thus excluding non-members from the incentive scheme may not be feasible. Thus, when firms consider addressing requests of TUs, they would do it to the best interest of all workers to ensure industrial peace.

The objective function of the union (or all workers), therefore, is to maximize their utility; which is the function of the difference between their actual pay and their reservation wage in the absence of a negotiation (w_{ait}). In a small developing country, where there is no unemployment benefit, the reservation wage rate may be taken as a weighted average of the cost of offering a labor service (the cost of subsistence, shelter and transport) assuming no employment elsewhere (w_s) and the likely pay from other alternative jobs (w_0) subject to the probability of securing alternative employment. This is expressed as:

$$w_{ait} = w_{sit} f(u) + w_{oit} (1 - f(u)), \quad (3.8)$$

where $w_{oit} > w_{sit}$, $f(u)$ is the probability of being unemployed given stock of unemployment (u). The higher the rate of unemployment in an economy and/or the lower the cost of rendering labor services, the lower will be the reservation wage rate.

Using a simplified form of a Stone-Geary utility function as in Kraft (2006), workers through their TUs, maximize their group utility

$$L_{it} (w_{Lit} - w_{ait}) \quad (3.9)$$

Where the expected nominal wage rate after negotiation is given by:

$$w_{Lit} = F(P_t, u_t, w_{ait}, Z_t, \mu_{it}) \quad (3.10)$$

(3.10) shows that w_{Lit} is determined by (u_t) , (w_{ait}) , firm's mark-up (μ_{it}) , the general price level in the economy (P_t) and other factors affecting wage rates (Z_t) such as government regulations (such as minimum wage, income tax, etc). The lower w_{ait} , P_t and/or μ_{it} , the lower would w_{Lit} be. w_{Lit} tends to decline as u_t increase. The sign of the partial correlation between w_{Lit} and Z_t depends on the type of intervention.

Following Rodrik (1997), Slaughter (2001) and Tybout (2000), removal of trade barriers increases imports and price elasticity of goods; which in turn reduces market power of firms (μ_{it}) . Lower profits translate into lower rents to firms and workers (Abraham, et al., 2009). Decline in the general price level (P_t) reduces the demand for workers for a wage increase. Poor performing firms may exit out of the market. Surviving firms may tend to use modern technologies. These two forces may lead into an increase in u_t ; which subsequently reduce (w_{ait}) , workers' bargaining power and w_{Lit} . Despite this expected overall effect, the reaction of firms is heterogeneous [Melitz and Ottaviano, 2008].

Following Abraham et al., (2009) and Dobbelaere and Mairesse (2009), firms' objective function is to maximize their short-run profit while strategizing for their long-run growth. This is given by the difference between total revenue and cost of labor and materials:

$$\pi_{it}(w_{Lit}, w_{Mit}, L_{it}, M_{it}) = P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it} \quad (3.11)$$

The equilibrium outcome is obtained by maximizing the asymmetric Nash bargaining equation of the form:

$$\max_{w_{Lit}, L_{it}, M_{it}} \Theta = [L_{it}(w_{Lit} - w_{oit})]^{\lambda_{it}} [P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}]^{1-\lambda_{it}} \quad (3.12)$$

where $0 \leq \lambda_{it} \leq 1$, λ_{it} and $(1 - \lambda_{it})$ are parameters capturing bargaining power of workers and firms respectively. λ_{it} has two theoretically possible extreme values ‘‘0’’ and ‘‘1’’; which imply absolute impotency and absolute power of workers in the wage setting process respectively [Boulhol et al., 2007]. The lower bound $\lambda_{it} = 0$ precludes the possibility of extraction of rent from workers themselves. In the context of a developing country, where the bargaining power of workers is limited, there could be a possibility that workers could be paid below their marginal revenue product, which in effect leads to $\lambda_{it} < 0$.

The respective first order conditions for the maximization of Equation (3.12) with respect to material, wages and labor inputs are³:

$$\frac{\partial(P_{it}Y_{it})}{\partial M_{it}} = w_{Mit} \quad (3.13)$$

$$w_{Lit} = (1 - \lambda_{it})w_{oit} + \lambda_{it} \left[\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right] \quad (3.14)$$

$$w_{Lit} = \frac{\lambda_{it}}{(1 - \lambda_{it})} \left(\frac{P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}}{L_{it}} \right) + \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right), \quad (3.15)$$

Manipulating Equation 3.13⁴ yields the condition for profit maximization of a firm operating under imperfect competition. Solving (3.14) and (3.15) simultaneously gives an expression for what is called ‘‘the contract curve’’:

³ Refer Appendix for the derivations.

⁴ Refer Appendix 1 Equations A3 – A7 for the derivation.

$$\left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right) = w_{ait} \tag{3.16}$$

(3.16) has a similar economic meaning as (3.13). In the presence of bargaining, the actual share of labour from the gross value of production can be given by

$$\alpha_{Lit} = (1 - \lambda_{it})\alpha_{Lit}^a + \lambda_{it}(1 - \alpha_{Mit}) \tag{3.17}$$

where α_{Lit}^a and α_{Lit} are the possible shares of the labor cost from the total value of production calculated based on alternative wage without bargaining and with bargaining respectively; whereas α_{Mit} represents the same as before. Assuming that a firm maximizes its short-run profit by equating its MRP of labor but with the alternative wage, Equation (3.3), which is implicitly in Equation 3.7, can be written as:⁵

$$b_{Lit} = m_{it} a_{Lit}^a \tag{3.18}$$

However (3.14) could be written as⁶

$$\alpha_{Lit}^a = \alpha_{Lit} + \left(\frac{\lambda_{it}}{1 - \lambda_{it}} \right) (\alpha_{Lit} + \alpha_{Mit} - 1) \tag{3.19}$$

Equation 3.19 helps to avoid computing the share of labor cost based on the alternative wage.

Following Abraham et al. (2009) and Dobbelaere and Mairesse (2009), substituting (3.18) into (3.17) yields:

$$b_{Lit} = m_{it} a_{Lit} + m_{it} \frac{\lambda_{it}}{1 - \lambda_{it}} (a_{Lit} + a_{Mit} - 1) \tag{3.20}$$

⁵ Similar process is followed as Equations A.1.3 –A.1.7 in the Appendix.

⁶ Refer Appendix for the derivation.

3.2 Empirical Models and Estimation Methods

Based on the above theoretical models, the empirical model is given by:

$$(y_{it} - k_{it}) = \beta_{Lit}(l_{it} - k_{it}) + \beta_{Mit}(m_{it} - k_{it}) + [\theta_{it} - 1]k_{it} + a_{it} + \epsilon_{it} \quad (3.21)$$

Where, $\epsilon_{it} \sim NID(0, \sigma^2)$.

From the estimated coefficients of Equation (3.21), the estimates of parameters of interest are obtained as:

- i) Mark-up taking account of the labor bargaining process is:

$$\hat{m}_{it} = \frac{\hat{b}_{Mit}}{a_{Mit}}. \quad (3.22)$$

- ii) The extent of rent sharing or success of bargaining is obtained by invoking (3.20), (3.21) and (3.22) and rewriting Equation (3.20) as:

$$l_{it} = \frac{b_{Lit} - m_{it}a_{Lit}}{b_{Lit} + m_{it}[a_{Mit} - 1]}. \quad (3.23)$$

- iii) As noted in Boulhol et al. (2007), using estimated coefficients of the parameters in (4.21) and the relationship in (4.22), (4.23) becomes

$$\hat{l}_{it} = \frac{\hat{b}_{Lit} - \frac{\hat{b}_{Mit}}{a_{Mit}}.a_{Lit}}{\hat{b}_{Lit} + \frac{\hat{b}_{Mit}}{a_{Mit}}[a_{Mit} - 1]}. \quad (3.24)$$

Estimating (3.21) using Ordinary Least Squares may lead to biased coefficient estimates of the production function and the resultant mark-up values. This is because of the fact that firms' prior expectation of their level of efficiency (which could be captured by the growth of TFP) tends to influence their decision on the amount of input acquisition and thus possibly causes endogeneity problem⁷. Endogeneity problem also comes from the fact that the left hand side variable $(y_i - k_i)$ is correlated with the right hand side variables or regressors $(l_i - k_i)$, $(m_i - k_i)$ and k_i .

Fixed effects address the firm time-invariant effects on (a_{it}) while leaving intact the time variant effects. The model uses growth rate figures, which can remove time-invariant effects through differencing. It addresses endogeneity problems neither. In random effects model, firm-specific time-invariant attributes are assumed to have zero mean, constant variance and uncorrelated with explanatory variables; albeit removed through differencing. Thus, random-effects model is estimated for comparison purposes.

GMM and system GMM, as suggested by Arellano and Bond (1991) and Blundell and Bond (2000) respectively, are among the econometric techniques that are often used to address endogeneity problems observed in the production function estimation. Both methods involve lagged dependent variables as explanatory variables; which, however, lead to correlation with unobserved firm level effects (δ_i) and lead to have inconsistent estimators. Arellano-Bond (1991) eliminates panel-level effects through first differencing errors and using instruments. Lagged levels of the dependent variable, the predetermined variables and the endogenous variables are used to form GMM-type instruments. First differences of strictly exogenous variables are used as standard instruments. However, lagged level instruments become weak in the Arellano-Bond estimator as the autoregressive process becomes

⁷ This problem of bi-directional causality was first recognized by Marshak and Andrews (1944) and various econometric estimations have been tried to address the problem.

too persistent ($\sigma_v^2 / \sigma_\varepsilon^2$ becomes too large) as identified by Blundell and Bond (1998).

Blundell and Bond (1998) in StataCorp (2009) proposed a system GMM estimator to address the problem. Lagged differences are used as instruments for the level equation and moment conditions of lagged levels are used as instruments for the differenced equation. Nonetheless, the use of such specification does not allow testing autocorrelation because of the fact robust two-step system GMM estimators has a seriously biased variance-covariance matrix. Linear Dynamic Panel Data model addresses this problem by incorporating Windmeijer (2005) robust estimator for two-step Vector Corrected Errors (VCE) that corrects these biases [Ibid, 2009].

Following StataCorp (2009), the general form of dynamic panel-data model has the form:

$$y_{it} = \sum_j^p \alpha_j y_{i,t-j} + X'_{it} \beta_1 + Z'_{it} \beta_2 + \delta_i + \varepsilon_{it}, i = 1, \dots, N; t = 1, \dots, T \quad \dots(3.25)$$

where α_j are p parameters to be estimated.

X'_{it} is a $1 \times k_1$ vector of strictly exogenous covariates;

β_1 is a $k_1 \times 1$ vector of parameters to be estimated;

Z'_{it} is a $1 \times k_2$ vector of predetermined and endogenous covariates;

δ_i are the panel level fixed effects (which may be correlated with the covariates);

$\varepsilon_{it} \sim IID(0, \sigma^2)$ and $E[\delta_i \varepsilon_{it}] = 0$ for all i and t .

LDPDM uses a similar test statistics as Arellano-Bond and Blundell and Bond system estimators for serial correlation of first differences of error terms and Sargan test for over identifications of instruments. On the basis of the theoretical specification of LDPDM as indicated in Equation 3.25, Equation 3.21 is estimated.

As firms operate longer in the market, there is higher possibility that they would adjust wages so as to ensure job security and industrial peace. Thus, firm age is used as a standard instrument in the LDPDM. Mark-ups and rent premium of workers and enterprises are jointly estimated using data for the overall period (1997 – 2007); trade reform period (1997-2002) and post reform period (2003-2007). Random effects model as suggested in Baltagi and Wu (1999) in Baltagi (2005) is also estimated for comparison purposes, which incorporates AR (1) to entertain unbalanced panels whose observations are unequally spaced.

This study has two major added values as compared to many other previous studies. With the exception of few, previous studies used OLS, fixed effects or system GMM; which may not address inherent econometric problems in the production function specification such as endogeneity. Secondly, this paper attempts to expand the possible values of the labour bargaining power parameter estimates taking into account a developing country context, which becomes consistent with the actual finding.

3.3 Source of Data and Description of Variables

Central Statistical Agency is the source of data large and medium scale firms for the period between 1996 and 2007. The study used unbalanced and unequally spaced panel data⁸ of firms employing 100 or more permanent workers. Because of the use of growth rate figures, one observation is missed for every firm and thus limiting the time dimension to eleven years. Variables used in the estimation of (3.21) are defined as follows.

Y_{it} stand for nominal gross value of production of firms. M_{it} capture the value of local and imported raw and intermediate inputs at the current factory gate prices. K_{it} represent the book value of fixed assets at the beginning of each period (taking care of the stock at period $t = t_0$, depreciation allowance deductions and investments made at period t). W_{it} include all types of

⁸ The total number of data points ($N \times T$) is 1663.

incomes of workers including basic wages and salaries, overtime-payments and incentives. α_{Lit} and α_{Mit} are ratios of workers' income and cost of material inputs to gross value of production respectively.

4. Empirical Results

4.1 Descriptive Statistics Results

Table 4.1 shows the descriptive statistics of the growth of nominal values of gross value of production(GNGVP), incomes of workers, cost of raw materials and values of fixed assets between 1996 and 2007.GNGVP was growing at an average rate of 20.7 percent per annum. The growth rate of values of fixed assets was the highest among the three different factor inputs because of entry of new firms with relatively high investment cost during the study period. The measures of dispersion such as range, standard deviations and coefficient of variation show considerable heterogeneity in the growth rate of outputs and inputs among firms. This is perhaps because of differences in size, input sources, market orientation, owner ship structure and other firm specific internal capabilities in terms of technology, skilled manpower and managerial endowments.

Table 4.1: Descriptive Statistics of Growth of Nominal Output and Input Variables

Statistics	Output	Wages and Salaries	Raw Materials	Fixed Assets
Minimum	-2.64	-2.32	-3.35	-4.05
Mean	0.207	0.236	0.188	0.245
Maximum	7.78	7.29	8.21	9.22
Standard Deviation	0.937	0.849	0.988	1.16
Coefficient of Variation	4.53	3.59	5.24	4.71

Source: Own Calculation based On CSA (Various Years).

Table 4.2 indicates the descriptive statistics of the relative share of labor and raw materials of firms over the period between 1996 and 2007.

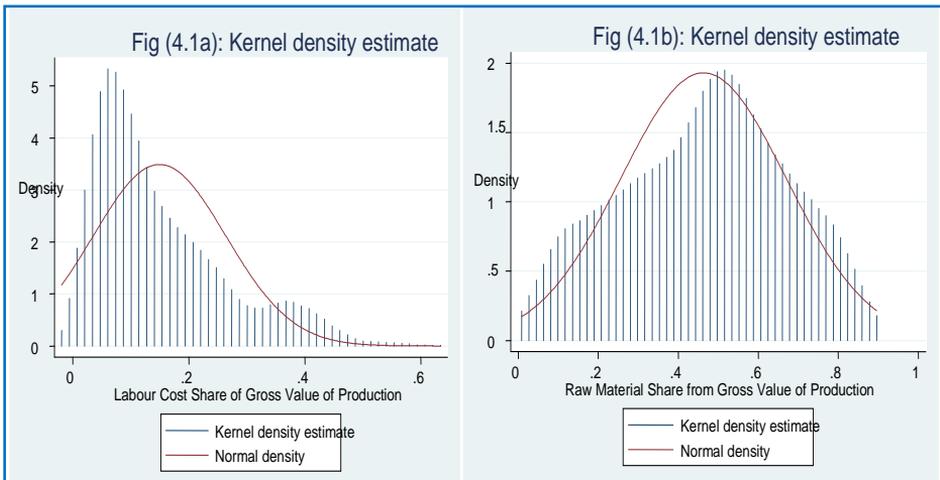
Table 4.2: Descriptive Statistics of Input Cost Shares from GVP (1996-2007)

Statistics	Labor Cost Share	Raw Materials Cost Share
Minimum	0.002	0.05
Mean	0.149	0.463
Median	0.113	0.483
Standard Deviation	0.114	0.207
Max	0.612	0.855

Source: Own Calculation based on CSA (Various Years).

The share of labor and raw material costs from gross value of production of firms vary from 0.1 percent to 61.2 percent and 5 percent to 85.5 percent respectively. Significant variation in the relative share of labor and raw materials cost across firms may be explained by the degree and complexity of processing, productivity and bargaining power of workers, the responsiveness of managers or owners for wage increment and other firm specific and external circumstances. Mean and median share of raw materials and intermediate input costs to the value of output goes as much as 3.4 and 4.6 fold of the corresponding share of labour cost.

Figure 4.1: Distribution of Share of Labor and Raw Materials Cost from Gross Value of Production



Source: Own Calculation based on CSA (Various Years).

Estimated Pearson coefficients of skewness for firm level labor and raw material cost shares from gross value of production showed 0.95 and 0.28 are respectively showing apparently different distributional patterns. This is because some firms spend relatively very high share of their gross value of production on wages and salaries as against the majority. This is witnessed from the mean share values exceeding the median and positively skewed distribution. Raw material cost shares show a tendency towards a normal distribution.

Table 4.3: Labor and Raw Material Cost Shares by Different Groups of Firms

Firm Groups		Labor Cost Share		Raw Materials Cost Share	
		Mean	Median	Mean	Median
Ownership	Public	0.169	0.134	0.476	0.487
	Private	0.120	0.084	0.479	0.454
Input Source	Domestic Resource Based	0.159	0.122	0.456	0.484
	Import-Intensive	0.134	0.098	0.474	0.481
Output	Exporting	0.126	0.103	0.467	0.479
Market	Non-exporting	0.154	0.118	0.462	0.484

Source: Own Calculation based on CSA (Various Years).

As it is indicated in Table 4.3 state-owned, non-exporting and domestic resource-based firms⁹ spent on average a higher percentage of their gross value of production on wages and salaries as compared to private, exporting (firms that fully or partially sell their products to the external market) and import-intensive firms (firms whose imported inputs cover 50 percent or more of the total cost of raw materials) respectively. Whereas the action of state-owned firms may be driven by the principal-agent problem, the actions of non-exporting firms may be somehow reflected in their relative unproductive and hence uncompetitive behaviour in the face of the global economy.

⁹ Domestic resource based firms are those which 50% or more than 50 percent of their inputs from domestic sources; Otherwise, they are called import intensive firms.

4.2 Econometric Results on Mark-up and Workers' Premium

Table 4.4 summarizes the empirical results of LDPDM and random effects models of mark-up and bargaining power premium of TUs estimated based on data for the entire period. The model uses various instruments; lagged dependent variable (the difference between the growth rates of GVP and nominal values of fixed assets), endogenous variables (differences nominal values of fixed asset from the growth rates of wages and salaries and growth rates of the values of raw materials), the exogenous variable (growth rate of nominal values of fixed assets) and standard instrumental variables (firm age and lagged two and above values of dependent, endogenous and exogenous variables).

Wald chi-square, $\chi^2(3)$, test in LDPDM shows that all estimated coefficients of covariates are jointly statistically different from zero. First differenced errors are first-order serially correlated (AR (1)) by design. This does not necessarily show the moment conditions to be invalid unless the problem persists on a higher order [StataCorp, 2009]. The null hypothesis for the absence of AR (2) is not rejected; implying absence of statistical indication to believe that the estimated model suffers from misspecification. Sargan test fails to reject the null hypothesis that over-identifying restrictions are valid.

The random effects model also shows that estimated coefficients for covariates are jointly statistically different from zero. The coefficient for the growth rate of fixed asset variable ($\beta_k = (\theta - 1)$) was not statistically different from zero in both models; implying that firms with 100 or more permanent workers operate at constant returns to scale. The coefficients of the difference between growth rates of the labour cost and value of fixed assets and also the difference between growth rate of materials costs and value of fixed assets have had comparable estimates in both estimation methods. This shows consistency of results in both models.

Table 4.4: Regression Results of Mark-up and Labor Bargaining Power

Coefficient and Test Parameters	Random Effects	LDPDM
01	02	03
Growth rate differences of nominal values of wages and fixed assets	0.378*** (0.017)	0.387*** (0.048)
Growth rate differences of nominal values of raw materials and fixed assets	0.543*** (0.014)	0.562*** (0.044)
Growth rate nominal values of fixed assets	-0.003 (0.011)	0.013 (0.024)
Constant	-0.003 (0.106)	
JST for all coefficients (Wald – $\chi^2(3)$) P-value	0.00	0.00
AR(1): P-value		0.00
AR(2): P-value		0.26
Sargan (Chi-square 190): P-value		0.37
Bultagi-Wu LBI (AR (1))	2.65	
N	1663	1663

Source: Own computations based on CSA (Various Years).

Note: Two-step GMM with lag values of covariates and first differences of level variables are used as instruments for differenced and level equations. Log age is a standard instrument. The values in bracket are standard errors. *, ** and *** refer level of significance of 10%, 5% and 1% respectively.

Table 4.5 summarizes the regression results of mark-up and labor bargaining power premium model for both the reform period (1997-2002) and post reform period (2003 -2007). The growth rate of the nominal values of fixed assets became statistically insignificant once again in the two periods implying that trade regime change had no impact on scale economies of firms.

The estimated coefficients of the two other variables vary between the two regimes. The coefficient for the difference between the growth rates of labor cost and capital variable was relatively higher during the reform period than the post reform period. On the contrary, the coefficient for the difference between the growth rates of the values of materials and the values of fixed assets increased during the post reform period.

Table 4.5: Regression Results of Mark-ups and Labor Bargaining Power for Two Trade Regimes

Coefficient and Test Parameters	Up to Year 2002		Year 2003 and above	
	Random Effects	LDPDM	Random Effects	LDPDM
01	02	03	04	05
Growth rate differences of nominal values of wages and fixed assets	0.442*** (0.03)	0.475*** (0.056)	0.339*** (0.016)	0.373*** (0.06)
Growth rate differences of nominal values of raw materials and fixed assets	0.510*** (0.024)	0.506*** (0.052)	0.557*** (0.016)	0.586*** (0.047)
Growth rate nominal values of fixed assets	-0.013 (0.021)	0.003 (0.031)	-0.001 (0.013)	0.004 (0.029)
Constant	0.003 (0.016)		-0.008 (0.013)	
JST for all coefficients (Wald –chi-square) P-value	0.00	0.00	0.00	0.00
AR(1): P-value		0.00		0.00
AR(2): P-value		0.96		0.14
Sargan (Chi-square 190): P-value		0.18		0.64
Bultagi-Wu LBI (AR (1))	2.69		2.53	
N	803	803	860	860

Source: Own computations based on CSA (Various Years).

Note: Two-step GMM with lag values of covariates and lags of first difference were used as instruments for differenced and level equations. Log of age is a standard instrument. The values in bracket are standard errors. *** indicates 1% level of significance. Differences on the coefficients of the two variables in different periods have their own implications on the magnitudes of mark-up and also the bargaining power parameter or the rents accrue to workers following trade regime change. Mark-ups are estimated using (3.21), whose central tendency and measures of dispersion results are displayed in Table 4.6.

Table 4.6: Mark-up among Different Groups Firms (1997-2007)

Industrial Category		Mark-up +1				Mean t-ratio test
		Mean	Median	inter-quintile range	Coefficient of Variation	
Years (1997-2007)						
	Total	1.69	1.17	0.79	0.92	
Ownership	Public	1.8	1.17	1.01	0.92	-3.46
	Private	1.53	1.17	0.63	0.9	
Market	Exporter	1.56	1.19	0.93	0.63	1.58
Orientation	Non-exporter	1.72	1.17	0.77	0.96	
	Domestic	1.84	1.17	0.96	0.97	4.76
Input Source	Import	1.47	1.18	0.62	0.73	
Years (1997-2002)						
	Total	1.58	1.03	0.74	1.06	-1.29
Ownership	Public	1.62	1.03	0.82	1.04	
	Private	1.47	1.01	0.65	1.09	
Market	Exporter	1.31	1	0.65	0.76	2.08
Orientation	Non-exporter	1.62	1.03	0.76	1.08	
Input Source	Domestic	1.74	1.03	0.91	1.11	3.97
	Import	1.31	1.01	0.61	0.78	
Years (2003-2007)						
	Total	2	1.28	1.03	0.97	
Ownership	Public	2.22	1.32	1.46	0.95	-3.45
	Private	1.78	1.24	0.83	0.97	
Market	Exporter	1.9	1.32	1.55	0.71	0.75
Orientation	Non-exporting	2.03	1.26	0.96	1.01	
Input Source	Domestic	2.17	1.28	1.45	0.98	2.96
	Import	1.78	1.26	0.8	0.91	

Source: Own calculations based on CSA Survey (Various Years).

Mean and median values indicate that firms were operating on average with a positive mark-up during the entire period covered by the study. A considerable difference between the two central tendency statistics shows the existence of excessively high mark-ups obtained by few firms as against the majority. Similarly, both inter-quintile range and coefficient of variation

indices indicate large mark-ups' variations among firms. State Owned Enterprises (SOEs), non-exporting and domestic resource-based firms generate more mark-ups as against private, exporting and import-intensive firms respectively.

As against predictions of most recent theories and studies and the hypothesis of this paper, on the average firms raised their mark-ups and consolidated market-power in the post reform period. It might be partly because firms tended to familiarize themselves with subsequent trade policy shifts and developed internal capabilities to withstand competitive pressure. The 17.5 percent weighted average tariff rate is still large enough to safeguard firms from incoming competitive pressure. The positive correlation between trade reforms and mark-up is not an exception to Ethiopia. For instance, Goldar and Aggarwal (2005) found an increase in the price-cost margin in the post-reform period in most industries and the manufacturing sector as a whole in India.

The mark-up difference narrowed down from 23.7 percent to 6.8 percent between exporting and non-exporting and also from 32.8 percent to 21.9 percent between domestic resource-based and import-intensive firms respectively between the two periods. Public firms keep on raising mark-ups at a higher rate than private ones.

The bargaining power parameter estimate has a less than zero value ($\lambda_i < 0$) during the entire period and across different groups of firms. This is against Dobbelaere (2004) and Abraham et al. (2009) in Belgium, Boulholet al. (2007) in UK and Dobbelaere and Mairesse (2009) in France. This is on account of Belgium, UK and France being a well-developed economy; where workers have alternative sources of living and thus have a strong bargaining power. In the Ethiopian case, however, rents extracted owing to market-power of firms may not partially accrue to workers because of weak bargaining power as a result of high unemployment and limited alternative sources of income generating activities.

Table 4.7: Employer and Workers Premium in the Presence of TU

Parameters	Mean Shares	Overall	Up to 2002	After 2002
Raw material share	Total	0.46	0.48	0.44
	Public	0.45	0.48	0.42
	Private	0.48	0.5	0.46
Labor cost share	Total	0.15	0.15	0.15
	Public	0.17	0.16	0.18
	Private	0.12	0.11	0.12
Coefficients	Growth of the difference between labour cost and capital	0.39	0.48	0.37
	Growth of the differences between materials and capital	0.56	0.51	0.59
Workers premium	Total	-0.79	-4.76	-0.46
	Public	-0.62	-3.84	-0.27
	Private	-1.06	-8.7	-0.71
Employers rent	Total	1.78	5.76	1.46
	Public	1.62	4.84	1.27
	Private	2.06	9.7	1.71
Ratio of rent premium drawn from workers	Total	-0.44	-0.83	-0.31
	Public	-0.38	-0.79	-0.21
	Private	-0.51	-0.90	-0.42

Source: Own calculation based on CSA Survey (Various Years).

The total persons engaged in medium and large-scale firms employing 10 workers were only 133, 673 in 2007/08 [CSA, 2009] in spite of being the second most populous countries in sub-Saharan Africa. Neither there are adequate job opportunities in other sectors. Only about 50 percent of the total active population was engaged in different income generating activities in urban areas; the majority being self-employed in the informal sector in 2006 [CSA, 2006: PP 31-38]. As a result of this, Ethiopia observes high level of unemployment even among the relatively well-educated [Sernees, 2004]. This situation leads to low level of reservation wage; which in turn lessens the bargaining power of workers to the extent of facing a negative premium.

The rent extracted from public workers is lower than their private sector counterparts perhaps because of two reinforcing causes. First, TUs are generally weak but they are relatively stronger among SOEs than in private firms [Martha, 2012: P: 24]. Second, the motive of the private sector is primarily profit. SOEs may go beyond and tend to maximize social benefits [Okten and Arin, 2006]. Overall, the rate of rent extraction from workers has somehow reduced after the reform. This is partly attributed to a further increase in mark-up of firms after the reform. The pattern has been the same in both state and private sector firms.

5. Conclusion

Trade theories advocate that firms operating in an imperfect market have the leverage to set prices above equilibrium outcome of a purely competitive market by a certain mark-up. In the presence of trade barriers, mark-ups and market-power of firms would be higher than otherwise. Because of insider information or otherwise, workers may bargain and influence to have a share of the rent accrued to firms' market-power. Opening up markets will reduce mark-up of firms, bargaining power of workers and the associated rent. This theoretical prediction is not similar across firms; it distinguishes the effect by firm characteristics. The empirical evidences are also mixed.

Motivated by the recent trade reforms that took place between 1991 and 2002 in Ethiopia, the study explored whether there was a positive mark-up during and after trade reform; whether workers were entitled to have wages above the marginal conditions entail and to what extent this has changed during the post reform period.

Using firm level unbalanced data of firms employing more than 100 permanent workers for the period between 1996 and 2007; 1996 and 2002; and also 2003 and 2007, mark-up model with labor bargaining power parameter was estimated using LDPDM and random effects. Econometric tests such as autocorrelation, Sargan test and Wald tests were carried out.

Although they are not entirely the same, the magnitudes of coefficients of covariates are found to be similar in the two estimation methods. On average

firms are found to have a positive mark-ups over the entire period. However, there have been large inter-firm variations. On average, mark-up increased during the post reform. Albeit seemingly contradicts with the theoretical predictions, this result may be justified because of the fact that Ethiopian firms are not exposed fully to liberalized market. The country has still maintained a 17.5 percent weighted average tariff rate. Despite a temporary shock during the trade reform, the prevailing tariff shield enables them to recover and consolidate their mark-ups afterwards.

The estimated value of the parameter capturing the influence of TUs on wage setting is found to be negative. Firms take out rents from workers rather than sharing; perhaps because of weak bargaining power on account of high unemployment, limited alternative job opportunities. The rent extraction from workers tended to decline during the post reform. Rent seeking was found to be lower in SOEs than private firms perhaps because of having weaker group or union influence in the later.

The finding simply the following. It is valuable to consider the heterogeneous responses of firms towards trade reforms. Since trade reforms to-date have not reduced market power of many firms, further opening up, such as joining Common Market for Eastern and Southern Africa Free Trade Area, may bring a competitive push to improve TFP and reduce mark-up and market power of firms for the good of the society. Working towards attracting additional investment in the economy helps to address unemployment and improve bargaining power of workers. Finally, tackling the problems that cause for under capacity utilization of firms, such as shortages of raw materials, finance, etc, helps to improve their performance and pay their workers better.

References

- Abraham, F., J. Konings and S. Vanormeligen. (2009). 'The Effects of Globalization on Union Bargaining and Price –Cost Margins of Firms,' *Review of World Economy* 145: 13-36.
- Aidt, T and Z. Tzannatos. (2002). "Unions and Collective Bargaining: Economic Effects in a Global Environment", World Bank.
- Alby, P. J. P Azam and S. Rospabe. (2005). "Labour Institutions, Labour Management Relations and Social Dialogue", <http://info.worldbank.org/etools/docs/library>
- Arellano, M. and Bond, S. (1991). 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations'. *Review of Economic Studies* 58, 277-297.
- Athukorala, P. and Worku Gebeyehu. (2006). 'Trade Policy Reforms and Manufacturing Performance in Ethiopia', in Kishor Sharma and Oliver Morrissey (eds.), *Trade, Growth and Inequality in the Era of Globalization*. Routledge Taylor & Francis Group: London.
- Baltagi, B. H. (2005). *Econometric Analysis of Panel Data*. 3rd Edition., Wiley Publishers, UK.
- Baltagi, B. H. and Wu, P. X. (1999). 'Unequally Spaced Panel Data Regression with AR (1) Disturbances'. *Econometric Theory* 15, 814-823.
- Bersoufekad, Assefa. (2003) "Friedrich Ebert Stiftung: Ethiopian Trade Union Country Report", Addis Ababa. Available from <http://www.fes-ethiopia.org>>1/3/2015.
- Blanchard, O. and Giavazzi, F. (2003) 'Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets'. *The Quarterly Journal of Economics* 118 (3), 879-907.
- Blanchflower, D., A. Oswald and M. Sanfey, P. (1996). "Wages, Profits and Rent-sharing," *Quarterly Journal of Economics*, February, (227-250).
- Blundell, R. and Bond, S. (2000). 'GMM Estimation with Persistent Panel Data: An Application to Production Functions'. *Econometric Reviews* 19, 321-340.
- _____. (1998). 'Initial Conditions and Moment Restrictions in Dynamic Panel-Data Models'. *Journal of Econometrics* 87, 115 -143.
- Boulhol, H., S. Dobbeleare and S. Maioli. (2007). 'Imports as Product and Labour Market Discipline,' *Working Paper 2007/479*, Universiteit Gent.
- Brock, E. and S. Dobbeleare. (2006). "Has International Trade Affected Workers' Bargaining Power?" *Review of World Economics* 142(2): 233-266.
- CETU. (2011). "Country Situational Report of the Confederation of Ethiopian Trade Unions", Addis Ababa, Unpublished.

- Crépon, B., R. Desplatz and J. Mairesse. (2002). 'Price-Cost Margins and Rent Sharing: Evidence from a Panel of French Manufacturing Firms, Centre de Recherche en Economie et Statistique, Revised.
- _____. (1999). 'Estimating Price-Cost Margins, Scale Economies and Workers Bargaining Power at the Firm Level, CREST Working Paper G9917, Centre de Recherche en Economie et Statistique.
- CSA. (2009). *Report on Large and Medium Scale Manufacturing and Electricity Industries Survey*. Addis Ababa.
- _____. (2006). "*Report on the 2005 National Labour Force Survey*. Addis Ababa.
- Dobbelaere, S. (2004). 'Estimation of Price-Cost Margins and Estimation of Price Cost Margins and Union Bargaining Power for Belgian Manufacturing,' *International Journal of Industrial Organization*, 22(10):1381-1398.
- Dobbelaere, S. and J. Mairesse. (2009). 'Panel Data Estimates of the Production Function and Product and Labour Market Imperfections, '<http://www.tinbergen.nl>.
- Egger, H. and U. Kreickemeier. (2009). 'Firm Heterogeneity and the Labour Market Effects of Trade Liberalization,' *International Economic Review*, 50(1): 187-216.
- FDRE. (2003). "Proclamation 377/2003", Addis Ababa.
- _____. (1994). "Proclamation 88/1994", Addis Ababa.
- _____. (1993). "Proclamation 42/1993", Addis Ababa.
- Feliciano, Z. (2001). 'Workers and Trade Liberalization: The Impact of Trade Reforms in Mexico on Wages and Employment,' *Industrial and Labour Relations Review*, 55(1):95-115.
- Fisher, T. C. and D. J. Wright. (1999). 'Unionized Oligopoly and Trade Liberalization,' *Canadian Journal of Economics* 32:799-816.
- Goldar, B. and S. C. Aggrawal. (2005). "Trade Liberalization and Price-Cost Margin in Indian Industries", *The Developing Economies*, XLIII-3, 346-73.
- Goldberg, P. K. and N. Pavcnik. (2007). 'Distributional Effects of Globalization in Developing Countries,' <http://www.nber.org/papers/w12885>. Cambridge
- _____. (2005). 'The Effects of the Colombian Trade Liberalization on Urban Poverty'. National Bureau of Economic Research, Cambridge, *Working Paper* 11081. Available from <<http://www.nber.org/papers/w11081>> [1/10/2015].
- _____. (2004). 'Trade, Inequality and Poverty: What Do We Know? Evidence from Recent Trade Liberalization Episodes in Developing Countries,' Brookings Trade Forum 2004, 223-269.

- Goldberg, P. M. (2012). 'Trade Unions in Sub-Sahara Africa'. FES Trade Union Competence Centre Sub-Saharan Africa. Available from <<http://www.fes-southafrica.org>>. [1/3/2015].
- Goos, M. and Konings, J. (2001). 'Does Rent-Sharing Exist in Belgium? An Empirical Analysis Using Firm Level Data'. *Reflects et Perspectives*40 (1-2), 65-79.
- Greenaway, D, R. C. Hine and P. W. Wright. (1999). 'An Empirical Assessment of the Impact of Trade on Employment in the United Kingdom,' *European Journal of Political Economy* (15): 485-500.
- Gürtzgen, N. (2002). 'Trade Liberalization and Union Wages in a Differentiated Bertrand Duopoly', *Open Economies Review* (13): 131-151.
- Hall, R. (1988). 'The Relationship between Price and Marginal Cost in US Industry'. *The Journal of Political Economy* 96 (5), 921-947.
- Hoekman, B. and L. A. Winters. (2005). 'Trade and Employment: Stylized Facts and Research Findings,' *DESA Working Paper* (7): ST/ESA/2005/DWP/7.
- Huizinga, H. (1993). 'International Market Integration and Union Wage Bargaining,' *Scandinavian Journal of Economics* 95:249-255.
- Kraft, K. (2006). 'Wage versus Efficient Bargaining in Oligopoly,' *Managerial and Decision Economics* 27:595-604.
- López, A. and J. L. Gallardo. (2006). 'Manufacturing Real Wages in Mexico,' *Rev. Econ. Polit* 26(3).
- Martha, K. (2012). 'Employment Challenges in Ethiopia'. Available from <<http://www.fes-kenya.org>> [1/10/2015].
- Melitz M. J. (2003). 'The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity,' *Econometrica*, 71(6): 1695-1725.
- Melitz, M. J. and Ottaviano, G. (2008). 'Market Size, Trade, and Productivity', *Review of Economic Studies*, 75 :(295-316).
- Mezzetti, C. and E. Dinopolos. (1991). 'Domestic Unionization and Import Competition.' *Journal of International Economics*, 31: 79-100.
- Ministry of Finance and Economic Development. (MOFED). (2008). Tariff Revision, Unpublished.
- Mishra, P. and U. Kumar. (2005). 'Trade Liberalization and Wage Inequality: Evidence from India,' *IMF Working Paper WP/05/20*.
- Moreno, L. and D. Rodríguez. (2009). 'Markups, Bargaining Power and Off-shoring: An Empirical Assessment', memo, Universidad Complutense de Madrid and GRIPICO.
- Olley, G. S. and Pakes, A. (1996). 'The Dynamics of Productivity in the Telecommunication Equipment Industry' *Econometrica* 64(6), 1263 – 1297.
- Okten, C. and Arin, K. P. (2006). "The Effects of Privatization on Efficiency: How Does Privatization Work?," *World Development*, 34 (9): 1537-1556.

- Pavcnik, N., A. Blom, P. K. Goldberg and N. Schady. (2004). 'Trade Policy and Industry Wage Structure: Evidence from Brazil,' *World Bank Economic Review*, 18(3):319-344.
- Rama, M. (2003). 'Globalization and Labour Markets,' *World Bank Research Observer* 18(2): 159-186.
- Rodrick, D. (1997). 'Has Globalization Gone Too Far?' Washington D.C.: Institute for International Studies.
- Roeger, W. (1995) "Can Imperfect Competition Explain the Difference between Primal and Dual Productivity Measures? Estimates for U.S. Manufacturing", *Journal of Political Economy* 103 (2), 316-330.
- Sernees, P. (2004). "The Nature of Unemployment in Urban Ethiopia", Center for the Study of African Economies, Oxford University, CSAE, WPS/2004-01.
- Slaughter, M. (2001). 'International Trade and Labour Demand Elasticities,' *Journal of International Economics* 54(1): 27-56.
- StataCorp. (2009). *Stata: Release 11. Statistical Software*. College Station, TX: StataCorp LP.
- Tybout, J. R. (2000). 'Manufacturing Firms in Developing Countries: How well do they do, and why?' *Journal of Economic Literature* 38, 11-44.
- Windmeijer, F. (2005). 'A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators'. *Journal of Econometrics* 126, 25-51.

Annex 1: Clarification of Labour Bargaining Power Equation

Consider maximization of a Nash bargaining problem between a typical trade union and firm:

$$(A.1.1) \quad \max_{w_{Lit}, L_{it}, w_{Mit}} \Theta = [L_{it}(w_{Lit} - w_{oit})]^{\lambda_{it}} [P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}]^{1-\lambda_{it}}$$

For simplicity denote $A = [L_{it}(w_{Lit} - w_{oit})]$ and $B = [P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}]$.

The first order condition for material input (M_{it}) yields:

$$(A.1.2) \quad (A^{\lambda_{it}})([1 - \lambda_{it}][B^{-\lambda_{it}}]) \left(\frac{\partial(P_{it}Y_{it})}{\partial M_{it}} - w_{Mit} \right) = 0$$

$$(A.1.3) \quad \frac{\partial(P_{it}Y_{it})}{\partial M_{it}} = w_{Mit}$$

$$(A.1.4) \quad \frac{\partial(P_{it}Y_{it})}{\partial M_{it}} \frac{\partial M_{it}}{\partial Y_{it}} = \frac{\partial C_{it}}{\partial M_{it}} \cdot \frac{\partial M}{\partial Y} \cdot \frac{w_{mit}M_{it}}{P_{it}Y_{it}} \cdot \frac{P_{it}Y_{it}}{w_{mit}M_{it}}$$

$$(A.1.5) \quad P_{it}(Y) + P'_{it}(Y)Y_{it} = \frac{\partial C_{it}}{\partial M_{it}} \cdot \frac{1}{\beta_{Mit}} \alpha_{Mit} \cdot \frac{P_{it}}{w_{mit}}$$

$$(A.1.6) \quad P_{it}(Y) \left(\frac{1}{1 + \varepsilon(Y)} \right) = P_{it}(Y) \left(\frac{1}{\mu_{it}} \right) = \frac{1}{\beta_{Mit}} \alpha_{Mit} P_{it}$$

$$(A.1.7) \quad \beta_{Mit} = \mu_{Mit} \alpha_{Mit}$$

The first condition with respect to wages (w_{Lit}) then becomes:

$$(A.1.8) \quad (\lambda_{it}L_{it}A^{\lambda_{it}-1})(B^{1-\lambda_{it}}) + ([\lambda_{it} - 1][-L_{it}]B^{-\lambda_{it}})(A^{\lambda_{it}}) = 0$$

$$(A.1.9) \quad \lambda_{it} \left[\frac{A}{B} \right]^{\lambda_{it}-1} = \left([\lambda_{it} - 1] \left[\frac{A}{B} \right]^{\lambda_{it}} \right)$$

$$(A.1.10) \quad (1 - \lambda_{it})A = \lambda_{it}B$$

Substituting the values of A and B into (A.1.10) gives

$$(A.1.11) \quad (1 - \lambda_{it})(L_{it}(w_{Lit} - w_{oit})) = \lambda_{it}(P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it})$$

$$(A.1.12) \quad L_{it}w_{Lit} = \lambda_{it}(P_{it}Y_{it} - w_{Mit}M_{it}) + (1 - \lambda_{it})L_{it}w_{oit}$$

$$w_{Lit} = (1 - \lambda_{it})w_{ait} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) \quad (\text{A.1.13})$$

The first order condition with respect to labour (L_{it}) becomes:

$$(\text{A.1.14})$$

$$\lambda_{it} (w_{Lit} - w_{ait}) (A^{\lambda_{it}-1}) (B^{1-\lambda_{it}}) + (1 - \lambda_{it}) (B^{-\lambda_{it}}) \left(\frac{\partial(P_{it}Y_{it})}{\partial L} - w_{Lit} \right) A^{\lambda_{it}} = 0$$

$$\lambda_{it} (w_{Lit} - w_{ait}) B = -(1 - \lambda_{it}) \left(\frac{\partial(P_{it}Y_{it})}{\partial L} - w_{Lit} \right) A = 0 \quad (\text{A.1.15})$$

Substituting the value of A and B into (A.1.15)

$$(\text{A.1.16})$$

$$\lambda_{it} (w_{Lit} - w_{ait}) [P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}] = -(1 - \lambda_{it}) \left(\frac{\partial(P_{it}Y_{it})}{\partial L} - w_{Lit} \right) [L_{it}(w_{Lit} - w_{ait})]$$

$$(\text{A.1.17})$$

$$\lambda_{it} [P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}] = -(1 - \lambda_{it}) L_{it} \left(\frac{\partial(P_{it}Y_{it})}{\partial L} - w_{Lit} \right)$$

$$\lambda_{it} [P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}] = (1 - \lambda_{it}) L_{it} \left(-\frac{\partial(P_{it}Y_{it})}{\partial L} + w_{Lit} \right) \quad (\text{A.1.18})$$

$$w_{Lit} = \frac{\lambda_{it}}{(1 - \lambda_{it})} \left(\frac{P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}}{L_{it}} \right) + \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right) \quad (\text{A.1.19})$$

Solving (A.1.13) and (A.1.19) simultaneously gives

$$(\text{A.1.20}):$$

$$(1 - \lambda_{it})w_{ait} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) = \frac{\lambda_{it}}{(1 - \lambda_{it})} \left(\frac{P_{it}Y_{it} - w_{Lit}L_{it} - w_{Mit}M_{it}}{L_{it}} \right) + \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right)$$

$$(\text{A.1.21}):$$

$$(1 - \lambda_{it})w_{ait} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) = \frac{\lambda_{it}}{(1 - \lambda_{it})} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) - \frac{\lambda_{it}}{(1 - \lambda_{it})} w_{Lit} + \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right)$$

Substitute (A.1.13) into (A.1.21),

$$(A.1.22): \quad (1 - \lambda_{it})w_{ait} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) \\ = \frac{\lambda_{it}}{(1 - \lambda_{it})} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) - \frac{\lambda_{it}}{(1 - \lambda_{it})} \left((1 - \lambda_{it})w_{ait} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) \right) + \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right)$$

$$(A.1.23): \quad (1 - \lambda_{it})w_{ait} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) = \frac{\lambda_{it}}{(1 - \lambda_{it})} - \frac{\lambda_{it}^2}{(1 - \lambda_{it})} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) - \lambda_{it}w_{ait} + \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right)$$

$$(A.1.24): \quad (1 - \lambda_{it})w_{ait} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) = \frac{\lambda_{it}}{(1 - \lambda_{it})} - \frac{\lambda_{it}^2}{(1 - \lambda_{it})} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) - \lambda_{it}w_{ait} + \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right)$$

$$(A.1.25): \quad (1 - \lambda_{it})w_{ait} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) = \frac{\lambda_{it}}{(1 - \lambda_{it})} (1 - \lambda_{it}) \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) - \lambda_{it}w_{ait} + \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right)$$

$$A.1.26: \quad \left(\frac{\partial(P_{it}Y_{it})}{\partial L_{it}} \right) = w_{ait}$$

(4.8) of the main text or (A.1.13) in Annex 1 can be written as:

$$(A.1.27) \quad \frac{w_{Lit}L_{it}}{P_{it}Y_{it}} = (1 - \lambda_{it}) \frac{w_{ait}L_{it}}{P_{it}Y_{it}} + \lambda_{it} \left(\frac{P_{it}Y_{it} - w_{Mit}M_{it}}{L_{it}} \right) \left(\frac{L_{it}}{P_{it}Y_{it}} \right)$$

$$(A.1.28) \quad \alpha_{Lit} = (1 - \lambda_{it})\alpha_{Lit}^a + \lambda_{it} (1 - \alpha_{Mit})$$

$$(A.1.29) \quad \frac{\alpha_{Lit}}{(1 - \lambda_{it})} = \alpha_{Lit}^a + \frac{\lambda_{it}}{(1 - \lambda_{it})} (1 - \alpha_{Mit})$$

$$(A.1.30) \quad \frac{\alpha_{Lit}}{(1 - \lambda_{it})} - \frac{\alpha_{Lit}\lambda_{it}}{(1 - \lambda_{it})} = \alpha_{Lit}^a + \frac{\lambda_{it}}{(1 - \lambda_{it})} (1 - \alpha_{Mit}) - \frac{\alpha_{Lit}\lambda_{it}}{(1 - \lambda_{it})}$$

$$(A.1.31) \quad \alpha_{Lit} = \alpha_{Lit}^a + \left(\frac{\lambda_{it}}{1 - \lambda_{it}} \right) (1 - \alpha_{Lit} - \alpha_{Mit}) \quad \text{or}$$

$$\alpha_{Lit}^a = \alpha_{Lit} + \left(\frac{\lambda_{it}}{1 - \lambda_{it}} \right) (\alpha_{Lit} + \alpha_{Mit} - 1)$$