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Determinants of Horticulture Export Production: Evidence from Ethiopian Agriculture Sector Using Panel Data Approach

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Abstract

The study identified determining variables for the export production of horticulture firms and estimated it under the framework of the Cobb-Douglas production function. The study used secondary data from a panel of 64 horticulture firms from 2011 to 2017. The model of the production function is estimated with OLS, fixed, and random panel fixed effect models. Using the Hausman test, the fixed effect model is chosen and has the following major findings: fertilizer, capital, labor, and credit are statistically significant variables that positively influence the export performance of the horticulture firms. The finding draws attention to some key areas of policy relevance in which the policy that promotes industrial linkage and producing competitive products in the global market, challenges faced by horticulture firms, investing in research and development issues to minimize import items, and focusing on industrialized led agriculture are discussed.

***Keywords*:** Horticulture, export, panel data model, firms

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Introduction

Agriculture has always been a key sector for economic development mainly for developing countries. The Sub-Saharan African countries' economic performance has relied on agriculture. The sector contributes remarkable value to the countries’ GDP through local consumption and agricultural trade. For instance, the Egyptian agriculture sector employed 34 percent of the workforce, which in turn supports 55 percent of the total population, and contributes some 17 percent to the country’s GDP until the mid of 1970s (Hatab, 2010). Whereas, the Kenyan agriculture sector has played a vital role towards the country's GDP accounting for about 24 percent with an estimated 75 percent of the population depending on the sector either directly or indirectly. The country’s basic strengthen and challenges are related with agricultural sector performance (PKF, 2005). Likewise, the Ethiopian economy mainly depends to a significant extent on the agricultural sector which accounts for about 50 percent to the GDP. It is noted that almost 100 million inhabitants are populated and out of which only 15 percent live at urban areas. The rest 85 percent are farmers and pastoralists. Previously government was engaged in the production of food items on its state farms. But in recent time, majorities of those lands are privatized (Joosten, 2007).

In Ethiopia, agriculture has always dominated the economy, but manufacturing, construction, tourism, and hospitality are growing quickly. Manufacturing of leather and textiles has grown exponentially in recent years. The garment and apparel industry grew by approximately 51% over 6 years. On the other corner agriculture sector specifically for the production and export of fruits, vegetables, and flowers is booming by encouraging foreign revenue. It is noted that the country is the fifth highest foreign revenue earner from horticulture generating $245 million in 2013/14 (Ethiopian Agriculture and Strategies for Growth, 2017). Whereas, Kenya's second-highest foreign income is generated from the horticulture sector. The horticulture sector in Ethiopia has shown a slight contribution through foreign earnings to the overall economy passing internal and external challenges the sector faced (Chenery & Raduchel, 1971) (Girma A. J., 2012).

There is ample evidence that unfavorable domestic terms of trade for agricultural exports and declining output are the principal contributors to the dismal performance of Ethiopian traditional exports, and that these factors reflect the interaction of inappropriate domestic pricing policies and external shocks (Melaku & Abegaz, 2013). The study by Daniel Gebtonkom (2002) revealed that the inappropriate domestic pricing policies, inflation the country encountered, and external shock are situations that led the country to a number of macroeconomic imbalances, including budget deficits and balance of payments and debt problems. Similarly, Ethiopia has facing the shortage of foreign exchange earnings. This in turn constrains the importation of vital raw materials and this induces the deterioration of the quality of both the social and economic infrastructure. In such a case, and given that agriculture is the main support of the Ethiopian economy; that has been widely engaged in. Thus, an increase in agricultural exports is expected to contribute significantly to the improve most of the economic structure imbalance and shall correct the balance of trade.

In summary, the key problem is how to greatly and urgently increase the export production of the agriculture sector especially, the production of flower, fruits, and vegetable farms sustainably to generate high foreign exchange earnings and also efficient utilization of inputs that determine the export production. The understanding of the responsiveness of export supply to changes in price and non-price factors is indispensable in formulating a sound general export policy package. Where export supply responds negatively to prices, price changes cannot bring about an increase in export volume. With applicable policies, agricultural export production will increase and export earnings will be boosted. The overall objective of the study is therefore to assess empirically the determinants of flowers, vegetables, fruits, and recently herbs export production from 2011 up to 2017. The choice of these commodities is due to their ample source of foreign income and other related socio-economic benefits to the country and the sector's success might be used as a pilot for other sectors.

The recent research conducted on Ethiopian horticulture sectors indicates that the sector contributing a remarkable growth performance for less than two decades on export competitiveness and reducing foreign exchange deficit. The sector also helped in reducing the unemployment challenge in its part (WorldBank, 2014). However, efficient utilization of inputs imported for the production of high-value agriculture sectors and critical identification of external and internal determinants of the specific sector needs additional research and development issues. Given the large size of the agrarian sector in Ethiopia, it is crucial that continued effort should be made to enhance the sector more productive (WorldBank, 2014). Thus, this study has been concerned with the correlation of explained determinants of export horticulture firms' production using panel data set for the Ethiopian Agriculture sector for better production and enhancement of export revenue.

Despite the tremendous efforts made and the economic growth achieved, the Ethiopian economy remains under pressure by structural problems. Ethiopia has engaged in the production and export of an agriculture sub-sector called horticulture. Horticulture sector items to be produced and exported to different countries are flowers, fruits, vegetables, and herbs. The sector is playing an essential role for the promotion of export value. Therefore, the general objective of this research paper is to explore and examine determinants of export production for the Ethiopian Horticulture sector.

Literature Review

Horticultural crops are diverse; they include annual and perennial species, as edible and ornamental plants. These plants help sustain and enrich our lives by providing nutritious food, and enhancing the beauty of our homes and communities, foliage like tomatoes, cucumber, and squash are considered vegetables and reduce our carbon footprint (USDA, 2008). The economical production and competitive performance through producing high-value output depend on the efficient utilization of inputs and proper identification of internal and external determinants of the sector to seek the country's strategic plan. Therefore, identifying the determinants that strongly affect production and finally either declining the output or increasing benefit is the crucial thing. Thus, sustainable agriculture development considers not only the requirement of future production increase but also maintaining the quality environment, water, and soil preservation (Mehdi, 2012).

The African continent is a developing world to continue experiencing difficulties in a situation after the green revolution of the 1970s and 1980s. Jules (2012) stated that the continent is far apart from brilliant agriculturally. The governments of the continents have promoted the increased use of agricultural inputs in their own countries inspired by the Asian Green Revolution which was brought about by using high-yielding seed and fertilizer technologies (Crawford, 2003). And it is also argued that the entry point for strengthening is the use of organic and inorganic fertilizers in production. If soil fertility is not improved, the use of other technologies such as high-yielding varieties will not have a significant impact on production. There are also views that the dependency on chemical fertilizers only for agricultural production might not be sustainable as it results in the depletion of organic soil contents thereby reducing the potential benefit of fertilizer utilization.

On the other hand, the main reason for the failure history of the Malawian horticultural exporting farms was insufficient financial support, poor grading, inappropriate packaging, high internal cost of transportation, expensive freight, and inadequate infrastructure. Moreover, the country's irrigation system was improper; the absence of a cold room to store the farm products to lower the temperature for the vegetables failed the sector. The above reasons ultimately led to low quality of exports (Abbas & Yemane, 2015). There are different like cold stores with the necessary equipment, flower exchanges, and transportation is factors affecting flower export.

Human capital is an essential element in the production of agriculture. So as to produce high valued yielding, the competent, knowledgeable and capable personalized labor force is vital for the success of the country at large and the organization in particular (T.Russel, James, & J.K, 2011). A key tenet within micro organizational inquiry is the availability of human capital and it has important performance implications. The case holds true for macro organizational inquiry that the labor force is a key determinant of firms' performance and a key factor for the entity's goal (Takeuchi & Lepak, 2007).

The large literature on estimating the performance of production functions had been evidenced following the input-output economic research although much of the economic theories yield testable implications in relation to technology and performances of economic optimization (Levinsohn & Petrin, 2003). Marschak and Andrews (1944) had applied focusing on the intuitive nature of estimating production function parameters for identifying the potential correlation between input levels and output levels. This initiates to derive out the traditional ordinary least square model of estimating the firms' production function and then the contemporary alternative estimation approaches.

Technologies in Ethiopian agriculture, and biological and chemical technologies are the most promoted technologies. The widely used technologies by farm operators in Ethiopia are fertilizer, improved seeds, and irrigation technologies. It is hypothesized that agricultural production is positively influenced by the application of each of these technologies like fertilizer and irrigation (Fufa & Hassan, 2006). Here, in this study irrigation was dropped and fertilizer is taken as one independent variable in explaining horticulture export production performance. According to Fufa & Hassan (2006), access to credit capital is the scarcest asset in developing countries due to the traditional performance of agriculture and the infancy of manufacturing and industries' performance. There is a need for money to adopt new technologies such as importing machineries, fertilizer, and chemicals, and also to have intermediate goods to export the output produced, the investors require finance. In addition, banking institutions are in trouble with having enough deposits to finance investments. Thus, the lack of foreign currency affects banking institutions to lend money.

Using firm-level unbalanced panel and estimating with semi-parametric approach of OP, Canfei & Rudai (2013) exhibited as government subsidies as well as bank loan created unclear correlation with firms' total factor productivity. However, the authors reported that key industrial support by the government together with firm-specific subsidies and bank loan showed more productive in Chinese manufacturing firms. Moreover, Oyatoya (1983) revealed that credit provides the basis for increased production efficiency through the specialization of functions thus bringing together in a more productive union the skilled labor force with small financial resources and those who have substantial resources but lack entrepreneurial ability.

Export credit is an important variable in explaining export supply. In Cameroon, nearing the end of each crop season, special credits are put at the disposal of exporters to enable them to export farm output. This has been an important component of government policy to promote the export of primary products. The credits were essentially loans given on preferential terms. It should equally be noted that there was an opportunity cost for these preferential loans, as other sectors of the economy were deprived of such privileges (Daniel Gebtonkom, 2002). The coefficient of export credit is expected to be positive because the larger the magnitude of credits disbursed, the greater the possibility of increased export volume. Hence, the Ethiopian government decided to support the sector by facilitating credit mainly through the Development Bank of Ethiopia. The Bank provides credit accessibility to farmers engaged in horticulture production and export. Thus, this credit variable is measured in terms of the Ethiopian currency (Birr) that the investors took in the production and exportation time. It is hypothesized that the availability of credit is expected to increase agricultural production and income.

Discerning traditional Solow's Standard growth accounting model and then developing their own dynamic approach, Olley & Pakes (1996) measured the determinants of firm productivity through total factor productivity collecting firm level deflated input and output and making industry, location, and year fixed effects as the control variables. The finding indicated as human capital created a positive relationship with firms' total factor productivity and qualitatively increased the firms' productivity growth. Capturing Solow's Standard growth accounting model, Smolny (1995a) found the positive effect of firm size (i.e. large firm) on firm productivity growth using an augmented growth accounting approach within the production function framework for the firm-level panel of manufacturing firms in West Germany. Here, in this study human capital is also used to determine agriculture production in general and specifically horticulture sector export production performance. Human labor has expected to increase horticulture production and foreign earnings. Moreover, physical capital and intermediate input created a positive effect on the production of firms and the correlated result of intermediate input pointed out similar inference with the positive link of imported intermediate input explored by Girma (2014) for Ethiopian manufacturing firms. Girma, (2014) used firm-level panel under the growth accounting model in the framework of production function and with the estimation of dynamic and static effect independently.

Recently, Thanapol (2015) used different estimation techniques which built-in traditional ordinary least square (OLS), Fixed Effect (FE), and Random Effect (RE) estimators to investigate firm productivity determinant factors on Thailand industries and compared the results under firm-level panel data within Cobb Douglas production function framework. Thus, skilled labor and productivity exhibited a significantly positive relationship. Using other methods of estimation, Wodajo & Senbet, (2013) established agreeable results in the effect of experienced labor and private firm for Ethiopian manufacturing. Here, this study has considered manufacturing firms and productivity proxy to agricultural firms and its production performance. Therefore, it is expected that human capital has a positive influence on the export performance of the horticulture sector.

Capital ownership by the farm producer and exporter is very essential. Sipayung (2015) stated that especially for capital that directly supports the production process greatly helps the performance of the company. The author analyzed that capital increase in the form of advanced machinery, transportation, distribution of goods, land expansion, and also investment will be encouraged and increased and the variable can support the survival of the company. Thus, the firms can able to achieve their objective and easily can export output produced to users. Hence, if the amount of capital is increased, there will be greater performance on production and export.

Method of the Study

The survey data was compiled from Ethiopian Revenue and Customs Authority (ERCA), Ethiopian Horticulture Development Agency (AHDA), Ethiopian Horticulture Producer Exporters Association (EHPEA), and Development Bank of Ethiopia (DBE) under the capacity of micro level to accomplish the research taking the recent seven years starting from 2011 up to 2017 sample. The data set comprises horticulture sectors mainly cut flower and then vegetables, fruits, and herbs for sixty-four farms to measure the determinants very well, active farms are selected from about one hundred twenty farms engaged in this sector.

The study used to estimate firm-level production and compares the result with the estimating results of OLS, Fixed Effect, and Random Effect estimators. In order to investigate the impact of determinants on the export production output of horticulture sectors, the study specified a simple empirical production function. Consider the establishment level of production measurement of the sectors' firm output using sales revenue at basic price created functional relationship with its correspondent inputs. That is, $Y = f(A, K, L, I)$, where "**Y**" denotes firms' output, "**K**" indicates Firm level capital stock, "**L**" denotes for labor "**I**" represents firms' Intermediate input and **A** stands for the firms' residuals that might not be explained by the firms' inputs. This functional relationship can put in the form of Cobb-Douglas production function as follows.

$$Y_{it} = A_{it}K_{it}^{\beta k}L_{it}^{\beta l}I_{it}^{\beta I}C_{it}^{\beta c} \quad \text{......} \quad (1)$$

To this firm production function's context, labor (L) is the aggregate staff of employee engaged in the production and export of the firms' output, Input (I) also decomposes to fertilizer (fzr) imported for the production of the sector and chemicals (chi) imported for the production of horticulture. Finally, the credit facility taken from the bank for the entire production is denoted by "cr" and K is capitals that are property plant and equipment imported for the production of the sector. Inputs other than labor and capital are characterized as agricultural inputs of the given firm. Hence, the natural log derivation of Equation (1) gives a linear production function as:

$$\log(Y_{it}) = \beta_0 + \beta_k \log(Capital_{it}) + \beta_l \log(Labor_{it}) + \beta_{fi} \log(Fertilizer_{it}) + \beta_{chi} \log(Chemical_{it}) + \beta_{cr} \log(\text{Credit}_{it}) + \varepsilon_{ijt} \quad \text{......} \quad (2)$$

The above equation has been presented by symbolizing the variables on professional equation as follows.

$$lny_{it} = \beta_0 + \beta_k lnk_{it} + \beta_l lnlbr_{it} + \beta_{fzr} lnfzr_{it} + \beta_{chi} lnchi_{it} + \beta_{cr} lncr_{it} + \varepsilon_{ijt} \quad \text{..............} \quad (3)$$

Where, Y_{it} exhibits an output produced by the combined firm-level inputs such as entire employee, capital (k), imported agricultural inputs like fertilizer, chemicals, and credit facility have been processed from the bank. The subscripts below the baseline i, denoted to represent the horticulture farm and t represents the time period in which data was collected and j represents each firm.

This Solow (1957) residual approach is a foundation for other estimating techniques of productivity both at the macro level, industry level as well as at firm level. Specifically, the technique in this study adapts to measure firm-level productivity through the functional relationship of firms' output and inputs. That is, to calculate firms' productivity as a residual, estimated input is deducted from the actual output. However, estimating equation (2) using OLS leads to biased productivity estimates caused by endogeneity/ simultaneity of input choices and selection bias. As first detected by Marschak, and Andrews, (1944), ordinary least square technique considered inputs exogenously in the production function instead of within the firms' characteristics including the firm's performance. Following the traditional OLS, other various methods have been invented to solve the recognized biases. Fixed and random effects estimators are among the invented estimating approaches adopted in this study for comparison.

Many researchers use a fixed effect model in order to adjust for unobserved time-invariant confounders (Angrist & Pischke, 2009). Fixed effect explores the relationship between predictor and outcome variables. On the Cobb Douglass production function of the study, the residual (A_{ijt}) based traditional OLS firm-level production performance estimates of deflated output regression on deflated inputs assuming a constant return to scale overwhelmed with several econometric and specification issues. To minimize the potential loophole under OLS, Pavcnik (2002) estimated Equation (3) using fixed effect techniques considering ω_{it} as plant-specific and time-invariant as follows.

$$y_{it} = \beta_0 + \beta_l lbr_{it} + \beta_{fzr} fzr_{\ it} + \beta_k k_{it} + \beta_{chi} chi_{\ it} + \beta_{cr} cr_{\ it} + \omega_{it} + \mu_{it}^{q} \quad (4)$$

Starting from its introduction through the empirical works of (Mundlak, 1961; Hoch, 1962), a fixed effect model overcomes simultaneity bias by using only the within firm variation in the sample and eliminates selection bias caused by the endogenous exit. However, the estimation of equation (4) leads to low capital coefficient estimates and created enormous variation between balanced and unbalanced sample coefficients (Olley & Pakes, 1996). It is also not able to choose inputs in reaction with shock since it imposes strict exogeneity in heterogeneous firms (Wooldridge, 2009).

Table 1

Variable Definition and Relationship with Firms' Production

Variables	Definition	Expected Sign
	Dependent Variable	
ln_val	Natural log of Sales Value of the horticulture sector firms' total output net of changes in inputs deflated by consumption price index, dependent variable.	
	Explanatory Variables	
Ln_lbr	Natural log of Firms aggregate labor in the production process, direct labor force to the firm Groups.	+ ve
Ln_k	Natural log of capital stock i.e., the average values of firms' property, plant, and equipment less depreciation values at the beginning plus end of each year to measure capital.	+ve
Ln_fzr	Natural log of imported fertilizer for the production	+ve
Ln_chi	Natural log of imported chemical raw material input	-ve
Ln_cr	Natural log of the firms' loan processed for the production, expansion and export of the firms' output.	+ve

Source: Own compilation based on literature

The data set comprised all agriculture-oriented sectors for the horticulture subsector mostly for privately owned firm groups which are experienced in production and export for more than four years and above with an average of 395 employees over the period of 2011 up to 2017. The data set has been significantly influenced by foreign direct investment and jointly invested with local investors. The entire data set has been obtained from data set of the Ethiopian Revenue and Customs Authority, Ethiopian Horticulture Producers and exporters Association and Ethiopian Horticulture

Development Agency on a yearly basis. Especially, Ethiopian Revenue and Customs Authority database has been updated monthly and has been uploaded on the government website.

This study has used the seven years of selected data tracking from the survey data set of ERCA Ethiopia leaving other additional years since the required data are being omitted and lack quality as well as completeness. The study has used recently updated data from the data bank from ERCA and also the collected data might not be fully complete and accurate enough due to lack of strong management to record data input. The data collection base was using Tax Identification Number of the farms in the industry as data generating an account. After a difficult dig, the researcher found out eighty TIN of horticulture investors and forwarded to the government office to generate raw data from data base in their counter. Unfortunately, only sixty-four farms' data has been taken for analysis. The remaining sixteen (80-64) firms' data was dropped due to inconsistency of record and insufficiency of information for the study. All data was requested for seven years period from 2011 up to 2017. This study was collected data only for firm groups which are producing flowers, fruits and vegetables and exports abroad, sales revenue, property plant and equipment, imported inputs for fertilizer, imported chemical, and credit borrowed from bank has been put in Ethiopian Birr. Whereas, labor employed in the sector was read in numbers.

Econometric Data presentation, Analysis, and interpretation

As it presented below in Table 3, the descriptive statistical summary of central tendency helps for measuring variability in overall, between, and within the given variables. The mean value exhibits the average value of each variable that shows a lower mean value in labor with the highest value in firms' sales value output. The data distributed around the average value can also be captured by the standard deviation which indicated the proximity of the data in the mean value over the reference period of 2011 to 2017. Moreover; the range also provides some evidence on the spread of data by measuring the variation between the minimum and maximum values. In this summarized analysis, the ln_val, which indicates the horticulture sector firms' sales value, underwent overall higher heterogeneity/volatility and within lower variation. For instance, the credit facility of the firms shows the highest overall variation among all the specified variables across the given years.

Table 2

Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
ln_val	overall	11.39923	2.782526	-5.479839	15.86835	N = 407
	between		2.324357	2.473939	15.66968	n = 64
	within		1.592886	.237595	19.6081	T-bar = 6.35938
ln_fzr	overall	7.744811	2.650663	-2.995732	15.07964	N = 407
	between		1.985098	3.399762	12.39321	n = 64
	within		1.742989	-1.373203	13.98072	T-bar = 6.35938
ln_chi	overall	9.134012	2.283677	-8.111728	13.80647	N = 407
	between		1.899322	2.002577	13.56797	n = 64
	within		1.411335	-3.526566	15.99161	T-bar = 6.35938
ln_k	overall	8.65292	2.328066	1.211941	14.08382	N = 407
	between		1.698691	5.200845	12.89694	n = 64
	within		1.580299	3.266	15.20649	T-bar = 6.35938
ln_lbr	overall	.4595588	1.011577	-7.623183	2.278086	N = 407
	between		.8468239	-2.558799	1.541375	n = 64
	within		.5508874	-4.604825	2.666864	T-bar = 6.35938
ln_cr	overall	7.296806	2.842539	-11.54338	24.23481	N = 407
	between		1.689261	2.688756	10.73208	n = 64
	within		2.342245	-7.235379	21.65218	T-bar = 6.35938

Source: Own computation using Stata

Sayef & Mabrouki (2017) pointed in their study, the correlation coefficient (r) is firstly applied to differentiate a positive or negative linear relationship. This is the proportional measure. It is known that, the nearer to 1 (in absolute terms) is the showing strong relationship otherwise not. Based on Table 3 presented below, all variables included in the empirical analysis are positively correlated; that means an increase in a variable will increase the other variable except for labor with fertilizer input.

Table 3

Correlation Analysis

	ln_val	ln_fzr	ln_chi	ln_k	ln_lbr	ln_cr

ln_val	1.0000					
ln_fzr	0.2860	1.0000				
ln_chi	0.5011	0.3195	1.0000			
ln_k	0.3355	0.3314	0.2758	1.0000		
ln_lbr	0.2754	-0.0149	0.2431	0.0817	1.0000	
ln_cr	0.3581	0.1832	0.2949	0.5158	0.0533	1.0000

Source: own computation using Stata

As it is stated in the previous section, model estimation underwent through OLS, FE, and RE models. Firm level econometrics estimators are implemented in this study within the framework of Cobb Douglas production function using panel data are robust Ordinary Least Square, and robust fixed and random effect models. Firstly, the traditional OLS model result will be depicted and the remaining two models with their post-estimation shall be presented, and finally, the Hausman test from two panel data estimation models are checked. At last, the chosen model will be discussed.

Traditional OLS Model of Econometrics Results:

Table 4 and Table 5 provide ordinary least square model results for firm groups that indicated as the p-value (Pro > F=0.0000) of the model is 100% sufficient and Adjusted R^2 exhibits 95% after checking heteroscedasticity and autocorrelation respectively. This entails that the group level firms' independent variables can determine the firm export production. The result tells that all the explanatory variables can significantly explain and achieved their level of significance at 1% (for fertilizer, chemical, labor employed and credit facilitated) and at 10% (for capital stock used for production applied in the firms). Both table 5 and 6 shows OLS estimation after post-estimation using robust and cluster commands to adjust standard errors for heteroscedasticity and autocorrelation respectively.

Table 4

Regression Result of Traditional OLS Robust for Heteroskedasticity

```
Linear regression                                      Number of obs. =     407
                                                        F (5, 401) =   34.91
                                                        Prob > F      = 0.0000
                                                        R-squared     = 0.3489
                                                        Root MSE      = 2.2591
------------------------------------------------------------------------------
-
             |               Robust
      ln_val |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
-
      ln_fzr |   .1200779   .0440401     2.73   0.007     .0334996    .2066562
      ln_chi |   .4176257   .0792633     5.27   0.000     .2618021    .5734492
        ln_k |   .1169109   .0706238     1.66   0.099    -.0219282      .25575
      ln_lbr |   .4852502   .1123964     4.32   0.000     .2642904    .7062099
       ln_cr |   .1724319   .0502848     3.43   0.001     .0735772    .2712866
       _cons |   4.161825   .6568887     6.34   0.000     2.870449    5.453201
```

Source: Regression result from traditional OLS approach

Table 5

Regression Result of Traditional OLS Clusters for Autocorrelation

```
Linear regression                                      Number of obs. =     407
                                                        F (5, 63) =   21.27
                                                        Prob > F      = 0.0000
                                                        R-squared     = 0.3489
                                                        Root MSE      = 2.2591
                                (Std. Err. adjusted for 64 clusters in firmid)
------------------------------------------------------------------------------
-
             |               Robust
      ln_val |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
-
      ln_fzr |   .1200779   .0546872     2.20   0.032     .0107942    .2293615
      ln_chi |   .4176257   .0765349     5.46   0.000     .2646829    .5705684
        ln_k |   .1169109    .045608     2.56   0.013     .0257706    .2080512
      ln_lbr |   .4852502    .125756     3.86   0.000     .2339468    .7365536
       ln_cr |   .1724319   .0620868     2.78   0.007     .0483614    .2965025
       _cons |   4.161825   .8599136     4.84   0.000     2.443425    5.880225
------------------------------------------------------------------------------
-
```

Source: Regression Result from Traditional OLS Approach

Fixed Effect Econometrics Model Results

Fixed effect econometric model can better include time in to consideration. The data in the Table 7 describes the fixed effect model results. As the result shows the p-value (Prob > F) indicated 100% sufficiency of the model for measuring the firms' export production and its related R^2 shows that 18% within, 8% between as well as 12% overall effects. As the between effects of this estimator is the lowest among the R^2 effects, it shows that the less benefits of individual and short run effects to firms' export production than the overall effect.

The corr (u_i, Xb) = 0.0040 proves the assumption of within estimator model since it positively correlates the error term with explanatory variables. The independent variables captured within this model show significance at level of 1% for labor and at level of 5% for fertilizer imported, capital deployed and credit funded but imported chemical raw material is insignificant to explain export production of the horticulture sector at 99% confidence level and at 5% level of significance. But capital shows negative effect on firm production as it reflected negative coefficient (-0.149822).

Table 7

Regression Result of Within Effect Estimator

```
Fixed-effects (within) regression               Number of obs      =       407
Group variable: firmid                          Number of groups   =        64

R-sq:  within  = 0.1779                         Obs per group: min =         3
       between = 0.0774                                        avg =       6.4
       overall = 0.1216                                        max =         7
                                                F(5,63)            =      6.09
corr(u_i, Xb)  = 0.0040                         Prob > F           =    0.0001
                                 (Std. Err. adjusted for 64 clusters in firmid)
------------------------------------------------------------------------------
-
             |               Robust
      ln_val |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
-
      ln_fzr |   .0932406   .0438547     2.13   0.037      .005604    .1808771
      ln_chi |  -.0495333   .0879514    -0.56   0.575    -.2252903    .1262236
        ln_k |   -.149822   .0670134    -2.24   0.029    -.2837376   -.0159064
      ln_lbr |   .8142457   .2236187     3.64   0.001     .3673795    1.261112
       ln_cr |    .207824    .096775     2.15   0.036     .0144345    .4012135
       _cons |   10.53529   1.260132     8.36   0.000     8.017114    13.05346
-------------+----------------------------------------------------------------
-
     sigma_u |  2.2330177
     sigma_e |  1.5828614
         rho |  .66557514   (fraction of variance due to u_i)
------------------------------------------------------------------------------
-
```

Source: Regression Based on Within Effect Estimator

The drawback of the Fixed Effect estimator is less efficient than the Random Effect estimator (i.e. higher variance), and also the fact that it is difficult to recover the coefficients on time invariant characteristics. So, if the assumption of no correlation between the individual error and explanatory variables holds, then any one can use Random Effects. Let us see RE estimator below.

Random Effect Econometrics Model Results:

Table 8 below exhibits the random effect model result for each estimated variable's coefficient in which all coefficients predict the changes over time and explain the difference in firm groups in both within the individual group and between individual group effects. The issues reliably necessitate that the given data represents the average effects of all explanatory variables over the firms' export production. Thus, the average effects of all variables for fertilizer imported, chemical imported and credit taken from the bank except capital investment shows the statistical significance and positive contribution to firms' export production. When we see the level of significance under 99% level of confidence and 5% level of significance, fertilizer and labor exhibit 1% level of significance and the remaining chemical and credit show a 5% level of significance.

It is assumed to be that the residual variables corr (u_i, X) = 0 within the assigned independent variables of the firm and it also demonstrates that there is no correlation through the difference across each units of the captured explanatory variables. Moreover, the Wald Chi^2 which results 38.94 with the zero P-value tests as the coefficients in this model are different from zero and thus it shows greater results than the tabulated F-test value. Consequently, the null hypothesis which states as the whole coefficients equal to zero is being rejected, The Wald test ensures again as all independent variables are able to give details on the change in export production communally and statistically. This econometric model results also confirmed as the p-value for the entire model is less than 1% significance level and tells us this random effect model is efficient to estimate the firms' output. Furthermore, R^2 indicates 15% within, 38% between as well as 29% overall effects. The between effects of this estimator is the highest among others and this indicates that time weights its importance than individual effects i.e., effects, in the long run, is more important than that of the short run. The "rho" in this model controls the effects of heterogeneity and autocorrelation and explains as the zero percent variance occurred following the variation across the firm panels' heterogeneity effect.

Table 8

Regression Result of Random Effect Estimator

```
Random-effects GLS regression                 Number of obs      =       407
Group variable: firmid                        Number of groups   =        64

R-sq:  within  = 0.1491                       Obs per group: min =         3
       between = 0.3775                                      avg =       6.4
       overall = 0.2854                                      max =         7
                                               Wald chi2(5)      =     38.94
corr(u_i, X)   = 0 (assumed)                  Prob > chi2        =    0.0000

                                (Std. Err. adjusted for 64 clusters in firmid)
------------------------------------------------------------------------------
-
             |               Robust
      ln_val |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
-
      ln_fzr |   .1259396    .043008     2.93   0.003     .0416455    .2102337
      ln_chi |   .1258893   .0530538     2.37   0.018     .0219058    .2298728
        ln_k |  -.0369587   .0461358    -0.80   0.423    -.1273832    .0534658
      ln_lbr |   .7065114   .1591402     4.44   0.000     .3946024     1.01842
       ln_cr |   .1931258   .0820948     2.35   0.019      .032223    .3540286
       _cons |   7.768977   .9253444     8.40   0.000     5.955335    9.582618
-------------+----------------------------------------------------------------
-
     sigma_u |   1.430554
     sigma_e |  1.5828614
         rho |  .44958569   (fraction of variance due to u_i)
```

Source: Regression Result Based on Random Effect Model

As mentioned earlier, the drawback of the Fixed Effect estimator is less efficient than the Random Effect estimator (i.e. higher variance), and also the fact that it is difficult to recover the coefficients on time-invariant characteristics. So, if the assumption of no correlation between the individual error and explanatory variables holds, then anyone can use Random Effects. Fortunately, there is a way of testing which estimator is more appropriate in any given situation. This is based on the fact that under the null hypothesis of random individual effects, the estimators should give similar coefficients. The Hausman test can be implemented by comparing the estimates from the two models presented below.

Fixed Effect vs. Random Effect Models:

It is true that Hausman test could be run to the firms' export production output determinants for choosing the more efficient model between fixed effect and random effect in which the null hypothesis states that the random effect is preferred over fixed effect. It also technically sprints to check the existence of unique errors correlated with the repressors. Indeed, the null hypothesis states as regressors' are not correlated.

The choice between fixed effects and random effects estimators continues to generate a hot debate among econometricians (Baltagi, Bresson, & Pirotte, 2003). Mundalk (1978) argued that the random effects model assumes the exogeneity of all the regressors and the random individual effects. In contrast, the fixed effects model allows for endogeneity of all the regressors and the individual effects. This all or nothing choice of correlation between the individual effects and the regressors prompted (Hausman & Taylor, 1981)to propose a model where some of the regressors are correlated with the individual effects. Despite these debates, most applications in economics since the 1980s have made the choice between random effects and fixed effects estimators based upon the standard Hausman test (Baltagi, Bresson, & Pirotte, 2003). Owing to the diagnostic tests, the model is well fitted as it passes all the diagnostic tests. Moreover, fixed effect estimation is the possible estimator than the random effect on journal article of (Levinsohn & Petrin, 2003) for the title named Estimating production functions using inputs to control for unobservable.

Fixed-effects models have the advantage of not requiring cov(x, u) = 0, which is often difficult to justify. Fixed-effects models are fully efficient as N gets large even if the true model is random effects. However, standard fixed-effects models cannot identify the effects of any variables that vary only across units (and has difficulty in identifying effects if most of the meaningful variation is across units). And also, anybody can do a Hausman test to examine whether the random-effects model is OK (It is a nested sub-model of the fixed-effects model.) The Hausman test is rejected if the estimates are sufficiently different, and the fixed-effects estimators are sufficiently precise. Common decision rule: Use random-effects unless the Hausman test rejects it. Here, the diagnostic test rejected Random Effect model Table 9 below.

Table 9

Hausman Regression Result of Fixed Effect Model Vs. Random Effect Model

```
hausman fixed random


                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+-----------------------------------------------------------------
-
      ln_fzr |    .0932406     .1259396        -.032699        .0104439
      ln_chi |   -.0495333     .1258893       -.1754226        .0201059
        ln_k |    -.149822    -.0369587       -.1128633        .0118434
      ln_lbr |    .8142457     .7065114        .1077343        .0627475
       ln_cr |     .207824     .1931258        .0146982               .
-------------------------------------------------------------------------------
-
                           b = consistent under Ho and Ha; obtained from
xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from
xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =      108.71
```

```
Prob>chi2 =      0.0000
(V_b-V_B is not positive definite)
```

Source: Regression Result Based on the Hausman test for choosing the better model

If the probability of the Hausman test is less than 5%, the fixed effect model is significant and if not, the random effect is significant. As per the result shown in Table 9, fixed effect produced two-fold nature and simultaneously gives detail for changes over time and the cross-sectional differences among each firm group. Truthfully, the best model between the two effects is identified using their Hausman test shows that the fixed effect coefficient is consistent under the null hypothesis and chi^2 is positive for 108.71. As mentioned above, the Prob>chi2 = 0.0000 indicates us it is less than 5%. The Hausman test statistic rejected the null hypothesis, suggesting that the fixed effects (within) regression was significantly different from the result of random effects and therefore is more efficient. Hence, the random effect model was rejected in this estimation and same with (Sayef & Mabrouki, 2017).

Summary of Findings and Policy Implication

Summary of Findings and Conclusion:

The economic growth in Ethiopia has exhibited improved performance rate with the sluggish change of output structure over the period. However, the growth performance relied heavily on the agriculture industry (WorldBank, 2017). The country's predominant agriculture sector is led by a traditional farming system instead of industrial-led agricultural development. However, the horticulture sub-sector is encouraging the sector to provide foreign earnings and create employment opportunities to job seekers. Although the revenue earned and future opportunity is quite appreciable, the development of horticultural farm production is still infancy and is unable to balance permanent income difference with other competitors and developed countries.

As a result of this, the permanent income of the nation has been inconsistent and undergoes with a lower level among Sub-Saharan African countries (WorldBank, 2017). The lack of consistent and formulating feasible and strong research and development strategy for the production of value-added horticulture firm to be vibrant has caused this economic inconsistency in its part. The horticulture firms in expanding export production under the Ethiopian Agriculture sector over the reference period is the one and decisive sector which lacks intensive and strong encouragement focus (Prebisch, 1950; Arrow K. , 1962).

The study employed using panel data set and estimation has been done using OLS, fixed effect and random effect estimation models. Based on Hausman diagnostic test, the fixed effect estimation model with OLS is best methods to present the findings. The study found using these estimators for the availed firm panel data as across firms' performance result predicted from 2011 up to 2017 using OLS and FE estimation model, all determinants have a positive effect on the firms' export production under OLS. However, capital has a significant negative effect and chemical pesticide has a negative insignificant effect on the production under FE estimation model. The negative significant effect exhibited by capital stock could be the effect of poor management of capital or misplacement of priority in terms of investment of capital where there are already full employment of resources and diminishing returns.

Studies depicted that poor management or if any could create a negative relationship between input and output in many developing countries. Capital has affected positively the firm export production under OLS estimation method. The variable is insignificant for RE. Furthermore, the coefficient of fertilizer has indicated its significance in OLS more than FE but human capital and credit have indicated their significance FE instead of OLS. On the other side, chemical pesticides exhibited statistically insignificant through the FE estimation model and negatively pressured the firm's export production with little coefficient value. This occurred due to the improper usage of the input (Fufa & Hassan, 2006). Human capital and credit facility revealed significant correlation through both estimators; OLS and FE estimation model. Moreover, both determinants have more coefficients through fixed effect estimation than OLS. Hence, fixed effect estimation model better estimated the shock.

Policy Implication

Floriculture is a very profitable enterprise and helpful in adjusting trade balance hence, offers great opportunity for people to be gainfully employed in the face of rising unemployment challenges. In order to improve the state of production, there is a need to address the major issues affecting the industry as such would go a long way in improving the nation's economy. Since Ethiopia exist in a good geographical location to the Middle East countries, horticultural output export is lucrative provided that good quality standard products are produced to compute the world market. In addition, wise planned market-oriented production of horticultural yield to supply them for European markets when they are out of production needs due attention. Therefore, focusing to increase the local material inputs not only for fertilizer but also for pesticides is vital. If the country has strong research and development center, technology-intensive production and export cycle shall be highly promoted. In turn, firms can produce more and might influence the outflow of local currency.

There should be an advanced policy that can favor the firms to produce at high level value output to generate ample foreign earnings and strong automated (investment in management system) support of government agency is vital. Correspondingly, practicable industrial linkage policy that enables to substitute imported material inputs should be developed. There should be responsive policy that follows sufficient utilization of capital stock in the production process to generate more proceeds to firms' export production. The government has to take care of infrastructure facilities for the horticulture firms facilitating transport (air, land, and marine), irrigation, sufficient electric power, promotion, and strong market linkage.

Some of the issues that need immediate attention are: (i) Increase in the production of value-added products like dry flowers, seeds, potted plants, micro propagated plants etc., (ii) Organizing appropriate training for personnel involved in production and export of floricultural products, (iii) To make the producers and exporters aware about effective quality control measures, (iv) Establishment of appropriate marketing and distribution channels, (v) Setting up of more export processing zones for floriculture products etc. Finally, this research leaves the analysis for determining variable coefficients across each firm together with other unaddressed firm level export production determinants to other researcher even using implemented models to this study.

6. References

AACCSA. (2015, October). OVerview of Ethiopian Manufacturing Sector(2014).

Abas, M. A., & Yemane, D. (n.d.). Factors Affecting Ethiopian Flower Companies' Export Performance. *International Journal of Current Research*.

Abbas, A., & Yemane, D. (2015). Factors Affecting Ethiopian Flower farms' Export Performance. *International Journal of Current Research*.

Abbot, J., & Makeham, J. (1980). *Agricultural Economics and Marketing in the Topics.* Lodon: Longman Publishers.

Abdul Rahim, A. S., Zariyawati, M. A., & Mohd Shahwahid, H. O. (2009). Determinants of MDF Exports: A Panel Data Analysis. *International Business Research, Volume 2*.

Ackerberg, D.A, Caves, K., & Frazer, G. (2007). Structural identification of production Function. *UCLA Mimeo*.

Agarwal, R. (1998). Small firm survival and technological activity. *Small Business Economics 11(3): 215–224.*

Agarwal, R., & Audretsch, D. (2001). Does entry size matter? The impact of the life cycle and technology on firm survival. *Journal of Industrial Economics 49(1): 21–43.*

Agency, E. T. (2017). *Ethiopian Agriculture and Strategies for Growth.* addis ababa: ATA.

Alao, R. (2010). "Productivity in the Nigeria Manufacturing Sub-sector. *European Journal of Economics, Finance and Administrative Sciences, Issue 20. Pp. 26.*

Alezzee, I. H. (September 2014). Aggregate Production Function, Its Determinants and Their Impacts on Aggregate Output: Case of Bahrain. *Journal of International Business and Economics, vol.2*.

Allwood, J., Ashby, M., Gutowski, T., & Worrell, E. (2011). Material efficiency: a white paper. Resour.Conserv. Recycl. 55, 362–381. (doi:10.1016/j.resconrec.2010.11.002).

Angrist, J., & Pischke, J. (2009). *Mostly Harmless Econometrics: An Impiricist's Companion.* Princeton: Princeton University Press.

Arellano, M., & 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.*

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics 68: 29-51.*

Aremu, M., & Adeyemi, S. (2011). Small & Medium Scale Enterprise as a Strategy for Employment Generation in Nigeria. *Journal of Sustianed Development.4(1)*.

Arnold, J. (2003). "Productivity Estimation at the Plant Level: A Practical Guide",. *Bocconi University, Milan, Italy. Available at: http://www.jensarnold.de/prodest.pdf.*

Arrow, K. (1962). The economic implications of learing by doing. *Review of Economic Studies, 29:155{173.*

Arrow, K. (1962). The economic implications of learning by doing. *Review of Economic Studies, 29:155{173.*

Arrow, K., Dasgupta, P., Goulder, L., Mumford, K., & Oleson, K. (2004). Are we consuming too much? J. Econ. Perspect. 18, 147–172. (doi:10.1257/ 0895330042162377).

Ayanwu, C. (2004). Productivity in the Manufacturing Industry. *Research Department,Central Bank of Nigeria Pp 124-135.*

Badar, H., Abdul, G., & Sultan, A. A. (2007). FACTORS AFFECTING AGRICULTURAL PRODUCTION OF PUNJAB (PAKISTAN) . *P.Journal of Agri. Science*.

Ball, R., & Smolenky.E. (1961, September). The Structure of Multiplier-Accelerator Models of the US 1909-1951. *Journal of International Economic Review*.

Baltagi, B., Bresson, G., & Pirotte, A. (2003). Fixed effects, random effects or Hausman-Taylor?: A pretest estimator. *Economics Letters, 79(3),* , pp. 361-369.

Baptist, S., & Hepburn.C. (2013). Intermediate inputs and economic productivity. *Phil Trans R Soc A 371: 20110565.*

Bartelsman, E., & Dhrymes, P. (1998). "Productivity Dynamics: U.S. Manufacturing Plants, 1972-1986",. *Journal of Productivity Analysis 9(1), 5-34.*

Bartelsman, E., & Doms, M. (2000). Understanding Productivity: Lessons from Longitudinal Microdata. *Journal of Economic Literature, 38, 3, 569-594.*

Berndt, E. (1982). Energy price increases and the productivity slowdown in United States manufacturing. *Federal Reserve Bank, Boston, MA, USA.*

Berndt, E., & Khaled, M. (1979). Parametric productivity measurement and choice among flexible functional forms. J. Political Econ. 87, 1220–1245. (doi:10.1086/260833).

Bernstein, J., & Nadiri, M. (1986). Research and development and intraindustry spillovers: An empirical application of dynamic duality. *National Bureau of Economic Research, Working Paper, 2002.*

Bigsten, A., & Gebreeyesus, M. (2007). TThe Small, the Young, and the Productive: Determinants of Manufacturing Firm Growth in Ethiopia. *economic development and cultural change; University of Chicago*.

Bigsten, A., & Gebreeyesus, M. (2008, April). Firm Productivity and Exports;Evidence From Ethiopian Manufacturing.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics 87: 115-43.*

Blundell, R., & Bond, S. (1999). "Initial Conditions and Moment Restrictionsin Dynamic Panel Data Models.". *Journal of Econometrics 87:115–43.*

Bruton, H. (1968). Import Substitution and Productivity Growth. *Journal of Development Studies, Vol.4 No.3*.

Canfei, H., & Rudai, Y. (2013). Determinants of Firm Failure;Empirical Evidence From China. *Growth and Change Vol.47 No.1 (March 2016).PP 72-92*.

Cassel, J. (1937). "Excess Capacity and Monopolistic Competition",. *Quarterly Journal of Economics, 51, pp. 426-43.*

Champerlien, E. (1935). The Theory of Monopolistics Competition,Cambridge;. *Harvard University Press,.*

Chenery, H., & Raduchel, W. (1971). Substitution in Planning Models. *Studies in Development Planning*.

Choi, I. (2001). Unit root tests for panel data. . *Journal of International Money and Finance 20: 249–272*.

Chole, E. (1992). *Underdevelopment in Ethiopia,* . \addis \ababa: by OSSR in memorial of Eshetu's Work, AddisAbaba, Ethiopia Oxford University Press (1958).

Coe, D., & Helpman, E. (1995). International R&D Spillovers. *European Economic Review, 39:859{87.*

Cohen, W., & Klepper, S. (1996). A reprise of the size of R&D. *Economic Journal, 106:925{51.*

Cohen, W., & Levinthal, D. (1989). Innovation and learning:The two faces of R&D. *Economic Journal, 99:569{596.*

Crawford, E. K. (2003). Input use and market development in Sub-Saharan Africa: an overview. Food Policy.

CSA. (2011). *Large and Medium Manufacturing and Electricity Industries.* Survey 2009-2010, Addis Ababa.

CSA. (2009). *Large and Medium Scale Manufacturing & Electricity Industry Survey.* Addis Ababa.

CSA. (2012). *International Standard Industrial Classification of All Economic Activities.* National Statistical Data Quality and Standards Coordination Directorate.

CSA. (2015). *CSA 2014; Abstract report of manufacturing survey.*

D.Mocnik. (2010). The impact of economic growth on the dynamics of enterprises;. *Empirical evidence for Slovenia's non-agricultural sector. Organizacija 43(4): 154–162.*

Daniel Gebtonkom. (2002). Determinants of Agricultual Exports. *African Economic Research Consortium*.

DBE. (2013). *Annual Report.* Addis Ababa.

E.Bartelsman, & Dhrymes, P. (1998). Productivity Dynamics: U.S. Manufacturing Plants 1972-1986, . *Journal of Productivity Analysis, 9, 1, 5-34.*

E.Bartelsman, Haltiwanger, J., & S.Scarpetta. (2004). Microeconomic Evidence of Creative Destruction in Industrial and Developing Countries,. *Policy Research Working Paper Series 3464, The World Bank*.

E.T.O., O. (1983). *An economic Appraisal of Small Farmers Credit Schemes: , 7(4):263-270.* Nigeria: A cost study of Western Nigeria, Saving and Development.

Edeme, R. K., Ifelunini, I. A., & Nkalu, N. C. (2016). A COMPARATIVE ANALYSIS OF THE IMPACT OF AGRICULTURAL EXPORTS ON ECONOMIC GROWTH OF ECOWAS COUNTRIES. *ACTA OECONOMICA PRAGENSIA*.

EHDA. (2016). *Yearly Statistical Bulletin.* Addis Ababa: Ethiopian Horticulture Sector.

Embassy of the Kingdom of the Netherlands. (March 2017). *HORTICULTURE STUDY Phase 1: Mapping of production of fruits and Vegetables in Kenya.* Netherlands: Match Makers Associates.

Ericson, R., & Pakes, A. (1995). Markov-perfect industry dynamics: a framework for empirical work. *Review of Economic Studies 62: 53–82.*

Evans, D. S. (1987a). "The Relationship between Firm Growth, Size and Age:Estimates for 100 Manufacturing Industries.". *Journal of Industrial Economics 35: 567–82.*

Färe, R., Grosskopf, S., & Kokkelenberg, E. (1989, August). "Measuring Plant Capacity, Utilization, and Technical Change: A Nonparametric Approach";. *International Economic Review, pp 655-666.*

Fernandes, A. M. (2008). 'Firm Productivity in Bangladesh Manufacturing Industries",. *World Development 36(10), 1725-1744.*

Foss, M. (1963). "The Utilization of Capital Equipment: Postwar Compared with Prewar.". *Survey of Current Business, 43:8-16.*

Fufa, B., & Hassan, R. (2006). Determinants of fertilizer use on maize in Eastern Ethiopia. *Agricultural Economics Research, Policy and Practice in Southern Africa*.

G, B., & Geissler.M. (2011). . 2011. The origins of entrants and the geography of the German laser industry. *Papers in Regional Science 90(2): 251–270.*

Giarratana, M., & S.Torrisi. (2010). Foreign entry and survival in a knowledge-intensive market: Emerging economy countries' international linkages, technology competences, and firm experience. *Strategic Entrepreneurship Journal 4(1):85–104.*

Girma, A. J. (2012). Horticultural Crops Production in Ethiopia. *Horticulture Research Division,*. Oromiya Agricultural Research Institute.

Girma, K. (2014, November 19). Importing and Firm Productivity in Ethiopian Manufacturing.

Griliches, Z., & Mairesse, J. (1995). Production functions: the search for identification. *National Bureau of Economic Research Working Paper Series 5067*.

Gunu.U. (2004). Small Scale Enterprise in Nigeria,Their Start up,Characterstics,Source of finance, and importance. *Journal of Social and Business Science*.

Haile, K. (1998). Land reform: revisiting the publice versus the private ownership controversy. *Ethiopian Journal of Economics*, 45-64.

Hannon, B., Blazeck, T., Kennedy, D., & Illyes, R. (1983). A comparison of energy intensities: 1963, 1967 and 1972. Resour. Energy 5, 83–102. (doi:10.1016/0165-0572(83)90019-1).

Hatab, A. A. (August 30, 2010). Determinants of Egyptian Agricultural Exports. *Scientific Research*, 1.

Hausman, J., & Taylor, W. (1981). Panel data and unobservable individual effects. *Econometrica 49,*, pp. 1377–1398.

Heathfield, D. (1972). The Measurment of Capital Usage Using Electricity Consumption Data for the UK. *Journal of the Royal Statistical Society A,, Vol.135,Part 2,*, P.211.

Hickman, B. (1964). "On a New Method of Capacity Estimation" . *Journal of American Statistical Association, 59, pp. 529-49*.

Hirschman, A. (1958). The Strategy of Economic Development.

Hoch, I. (1962). Estimation of production function parameters combining time series and cross-section data. *Econometrica 30: 34–53.*

Jaffe.A. (1986). Technological opportunity and spillovers of R&D:Evidence from Firms' Patents',profits and Market Value. *American Economic Review, 76:984{1001*.

Jaleel, A. (April 1968). Import Substitution in Indian Manufacturing Industry. *Journal of Development Studies.Vol.4,No.3*.

Johansen, L. (1968). Production functions and the concept of capacity in Recherches récentes sur la fonction de.

Joosten, F. (2007). *Development Strategy for the Export oriented Horticulture in Ethiopia.* Addis Ababa: Wageningen UR.

Jorgenson, D. W., & Grilliches, Z. (1967). "The Explanation of Productivity Change.". *Review of Economic Studies, Journal of Economic Growth, vol. 13, pp. 145–167.*

Jules, M. N. (2012). The effect oh Human Capital on Agricultural Productivity Cameroon. *International Business Research*.

K.Mannasoo. (2008). Patterns of firm survival in Estonia. *Eastern European Economics 46(4): 27–42.*

Katayama, H., Lu, S., & Tybout, J. (2003). "Why Plant-level Productivity Studies are often Misleading, and an Alternative Approach to Inference". , *NBER Working Paper 9617.*

Katayama, H., Lu, S., & Tybout, J. (2009). Firm-level productivity studies: illusions and a solution. *International Journal of Industrial Organization 27: 403–413.*

Kibaara, B., & Joshua Ariga, J. O. (2008). TRENDS IN KENYAN AGRICULTURAL PRODUCTIVITY. *TEGEMEO INSTITUTE OF AGRICULTURAL POLICY AND DEVELOPMENT*.

Kim, Y., & Kwon, J. (1977). THe Utilization of Capital and the Growth of Output in Developing Economiy;The Case of South Korean Manufacturing. *Journal of Development Economies*.

Kirkley, J. (1999). *Measuring capacity and capacity utilization in fisheries. FAO Fisheries Technical.*

Klein, L. (1960). Some Theoretical Issues in the Measurement of Capacity, Econometrica, 28, 272-86.

Klein, L. R., & Preston, R. S. (1967). . Some new results in the measurement of capacity utilization. *American EconomicReview , 57, 34–58.*

Klein, L., & Summers, R. (1966). The Wharton Index of Capacity Utilization. *Studies in Quantitative Economics,Univercity of Pennsylvania, Philadelphia,PA 94PP*.

Kumar, & Russell. (2002). Technological Change Technological Catch-up, and Capital Deepening: Relative Contributions to Growth and Convergence,. *AmericanEconomic Review 92(3)*.

Kydland, F., & Prescott, E. (1982). , (1982). Time to build and aggregate fluctuations. *Econometrica, 50/6:1345{70.*

Levihnsohn, J., & Petrin, A. (2000). "Estimating Production Functions Using Inputs to Control for Unobservables. *(NBER Working Paper 7819).*

Levin, R., & Reiss, P. (1988). Cost{reducing and demand creating R&D with spillovers. *Rand Journal of Economics, 19:538{556.*

Levinsohn, & Petrin. (1999). Value Added production function.

Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *Review of Economic Studies 70: 317–341*.

Lucas, R. E. (1988). 1988.On the mechanisms of economic development. *Journal of Monetary Economics, 22: 3-42*.

Mankiw, N., Romer, D., & Weil, D. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics 2:407{437.*

Mansfield, E. (1962). “Entry, Gibrat’s Law, Innovation and the Growth of Firms.”. *American Economic Review 52:1023–51*.

Marquardt, D. (1970). *Generalized inverses, ridge regression, biased linear estimation.*

Marschak, J., Andrews, & H, W. (1944). "Random simultaneous equations and the theory of production". *Econometrica, 12 (3, 4), 143-205.*

Mehdi, S. J. (2012). Factors Affecting in Sustainability of Agricultural Production Systems in Iran. *Scholars Research Library*.

Melaku, T., & Abegaz. (2013). Total Factor Productivity and Technical Efficiencyin the Ethiopian Manufacturing Sector. EDRI Working Paper 010. Addis Ababa: Ethiopian. *EDRI Working Paper 010. Addis Ababa: Ethiopian*.

Mensha Charles. (1999). Bank Credit Provision and Performance Measurement: the experience of rural banking in Ghana. Ghana.

Midi, H., & Imon, A. B. (2010). The Application of Robust Multicollinearity. *Journal of Applied Sciences*.

MoFED. (2002). Competitiveness of the Ethiopian Manufacturing Sector.

MoFED. (2010). Growth and Transformation Plan 2010/11-2014/15. Addis Ababa.

MoFED. (2010). Industrial Development. In MoFED, *Growth and Transformation Plan* (Vol. Volume 1 Main text, pp. 59-66). Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

Morris, M. K. (2007). *Fertilizer Use in African Agriculture: Lessons Learned and Good Practice Guidelines.* Washington, DC.: The World Bank.

Mulu, G., & Tetsushi, S. (August 2011). Global Value Chain and Market Formation Process in Emerging Export Activity: Evidence from Ethiopian Flower Industry. *National Graduate Institute for Policy Studies.* Tokyo, Japan: GRIPS.

Mundalk, Y. (1978). On the pooling of time series and cross-section data. . *Econometrica 46*, pp. 69–85.

Mundlak, Y. (1961). Empirical production function free of management bias. *Journal of Farm Economics 43: 44–56.*

Nadiri, M. (1993). Innovations and technological spillovers. *National Bureau of Economic Research, Working Paper, 4423.*

Nadiri, M. (1993). Innovations and technological spillovers. *National Bureau of Economic Research, Working Paper, 4423.*

Nolan, B., & O'Reilly, L. (1979). The Measurment of Capacity Utilization in Irish Manufacturing Industry. *Economic and Social Review,VOl 1No.1. PP.47-65.*

NPC. (2016). Growth and Transformation Plan II (GTP II). Federal Democratic Republic of Ethiopia.

NPC. (2016). *Growth and Transformation Plan II (GTP II)* (Vol. Volume 1 Main Text). Addis Abeba, Ethiopia: Federal Democratic Republic of Ethiopia.

Nto, P., & Mbanasor, J. (2011). "Productivity in Agribusiness Firms and its Determinants in Abia State. *Journal of Economics and International Finance, Vol. 3(12) Pp. 662-668.*

Nusrat, H. M. (2012). PROFITABILITY OF FLOWER PRODUCTION AND MARKETING SYSTEM OF BANGLADESH. *Bangladesh J. Agril. Research Center*.

Nystrom.K. (2007). An industry disaggregated analysis of the determinants of regional entry and exit. *The Annuals of Regional Science 41: 877–896.*, .

Olley, S., & Pakes, A. (1996). The dynamics of productivity in the telecommunications equipment industry. *Econometrica 64: 1263–1297.*

Onyeranti, G. (2012). "Concept of Measurement of Productivity. *Department of Economics, University of Ibadan.*

Oppenl• ander, K. H., & Poser, G. (1989). Handbuch der Ifo Umfragen. *Duncker & Humblodt, Berlin.*

Oyatoya, E. (1983). *An economic Appraisal of Small Farmers Schems.* West Nigeria: A cost study of Western Nigeria, Saving and Development.

Padma, M. (1991). " Economic Measures of Capacity Utilization in Some Selected Industries in India", 1960-61-1982-83,.

Palmerston, I. (2011). Challenges and Opportunities for Horticulture and Priorities for Horticultural Research at the start of the Twenty-First Century . *Acta Horticulturae*.

Panic. (1978). Average Capacity Utilization In Nigerian Manufacturing Firms.

Pavcnik, N. (2002). Trade liberalization, exit, and productivity improvements: evidencefrom Chilean plants. *Review of Economic Studies 69: 245–276.*

Penzkofer, H., Schmalholz, H., & Scholz, L. (1989). Innovation,Wachstum und Besch• aftigung. De Gruyter, Berlin, New York.

Phillips, P. B. (1999). Linear regression limit theory for nonstationary panel data. *Econometrica 67: 1057–1111*.

PKF, C. L. (2005). *Export Processing Zones Authority.* Kenya: International Research Network.

Porter, M. (1990). *The Competitive Advantage of Nations.* New York: Free Press.

Prebisch, R. (1950). 'The Economic Development of Latin America and its Principal Problems'. *Economic Bulletin for Latin America, 7. New York: United Nations.*

Rahmato, D. (2004). The Agricultural Policies of the imperial regime: what Lessons can we draw? *discussion paper presented on the occasion of the 50'" Anniversary of the establishment of Alemaya University*.

Raimi, L., & Adeleke, L. (2009). A Review and Measurment of Capacity Utilization in the Nigerian Economy;. *Humamomics,Vol.25 Iss;4.PP 274-284*.

Rama, k., & Simon, Z. (2015). Performance Measurement of Manufacturing industries in Ethiopia-An Analytical Study. *Journal of Poverty, Investment and Development ISSN 2422-846X; An International Peer-reviewed Journal Vol.7, 2015*.

Rama, k., & Simon, Z. (2015). Performance Measurement of Manufacturing industries in Ethiopia-An Analytical Study. *Journal of Poverty, Investment and DevelopmentISSN 2422-846X An International Peer-reviewed Journal Vol.7, 2015*.

Romer, P. (1987). Crazy explanations of the productivity slowdown. *NBER Macroeconomic Annual, 1:163{201.*

Romer, P. (1989). Human capital and growth: Theory and evidence. *National Bureau of Economic Research, Working Paper, 3173.*

Romer, P. M. (1986). Increasing Return and Longrun Growth. *Journal of Political Economy*.

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy 94: 1002-1037*.

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *Stata Journal 9(1): 86-136.*

Rosenstein, & Rodan'. (1943). Industrialization and the Big Push.

S.Bojnec, & A.Xavier. (2004). Entry and exit in transition economies. *The Slovenian manufacturing sector. Post-Communist Economies 16(2): 191–214.*

S.Estrin, & M.Prevezer. (2010). A survey on institutions and new firm entry:. *How and why do entry rates differ in emerging markets? Economic Systems 34: 289–308.*

Sayef, B., & Mabrouki, M. (2017, November). The Effect of Agricultural Export on Economic Growth in Soth Eastern Europe. *Munich Personal RePEc Archive*. Tunisia: MPRA.

Schneeweis, T., & Smolny, W. (1996). Das ifo Unternehmenspanel 1980{92 { Einige Ergebnisse einer Verkn• upfung der Umfragen des ifo Instituts. *Center for International Labor Economics, Universit• at Konstanz,Diskussionspapier, 32.*

Schumpeter J.A. (1933). *The Theory of Econometric Development.* London: Oxford University press.

Schurr, S. (1984). Energy use, technological change, and productive efficiency: an economic-historical interpretation. *Annu. Rev. Energy 9, 409–425. (doi:10.1146/annurev.eg.09.110184.002205).*

Segerstrom, P. (1991). Innovation, imitation, and economic growth. *Journal of Political Economy, 99:807{827.*

Siegfried, J., & BEvans, L. (1994). Empirical studies of entry and exit: A survey of the evidence. *Review of Industrial Organization 9(2): 121–155.*

Singer, H. (1950). 'The Distribution of Gains between Investing and Borrowing Countries'. *American Economic Review, 15: 473-85.*
Singer, H. (1958, April). The Concept of Balanced Growth and Economic Development;. *Theory and Facts*.
Sipayung, G. D. (2015). Taking Decision to Export based on Existing Factors at Manufacturing Firms: Study on 5 Major Islands in Indonesia. *International Institute of Social Studies*.
Smolny, W. (1995a). Sources of productivity growth{an empirical analysis with German Sectoral Data. *Center for International Labor Economics Universit• at Konstanz, Diskussionspapier, 21.*
Smolny, W. (1995b). International sectoral spillovers { an empirical analysis for German and U.S. industries. *Center for International Labor Economics, Universit• at Konstanz, Diskussionspapier, 29.*
Smolny, W. (1996a). Innovation, prices, and employment { a theoretical model and an empirical application for West German manufacturing firms. *Center for International Labor Economics, Universit• at Konstanz, Diskussionspapier, 37*.
Smolny, W. (1996b). Endogenous innovation in a model of the theory and empirical application for West German manufacturing . *manuscript.*
Solow, R. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics, 70:65{94.*
Solow, R. (1957). Technical change and the aggregate production Function. *Review of Economics and Statistics, 39:312{320.*
Solow, R. (1974). The economics of resources or the resources of economics. Am. Econ. Rev. 64,1–14.
Stiglitz, J. (1974). Growth with exhaustible natural resources: efficient and optimal growth paths. *Rev. Econ. Stud. 41, 123–137. (doi:10.2307/2296377).*
Streeten, P. (1959, June). Unbalanced growth. *Oxford Economic Paper*.
T.Russel, C., James, G., & J.K, D. (2011). Does Human Capital Matter? *Journal of Applied Psychology Vol. 96*.
Takeuchi, R., & Lepak, D. (2007). An Emperical examination of the Mechanisms meditating between high performance work systems and performance of Japanese organizations. *Journal of Applied Psychology*.
Taylor, J., & Harris, R. (1985). The Measurment of Capacity Utilization. *Applied Economics 17.849-866*.
Tesfaye, E. (2014). Determinants of Agricultural Exports in SSA: Evidence from planel study. *American Journal of Trade and Policy*.
Thanapol, S. (2015, October). Firm Productivity in Thai Manufacturing Industries;Evidence from Firm Level Panel Data. *Puey Ungphakorn Institute For Economic Research;Discussion Paper No.15 (January 2016).*
Tybout, J. (2000). "Manufacturing Firms in Developing Countries: How Well Do They Do,and Why?",. *Journal of Economic Literature 38(1), 11-44.*
Tybout, J. (2000). Manufacturing firms in developing countries: How well do they do, and why? *Journal of Economic Literature 38(1): 11–44.*
Uche, R. (1991). Modeling of Input Resources in Manufacturing Industries for Productivity Improvment. *International Journal of Technology s No..1(2015) 30;40*.
USDA. (2008). *www.agcensus.usda.gov*.

Van Beveren, I. (2010). “Total Factor Productivity Estimation: A Practical Review”,. *Journal of Economic Surveys 26(1), 98–128.*

Whitehead, A. (2002). Meta-Analysis of Controlled Clinical Trials. . *Chichester, UK: Wiley.*

Wodajo, T., & Senbet, D. (2013). DISTRIBUTIONS OF PUBLIC AND PRIVATE MANUFACTURING FIRMS AND DETERMINANTS OF PRODUCTIVITY IN ETHIOPIA. *Regional and Sectoral Economic Studies Vol. 13-1 (2013);St. Louis Community College University of Northern Colorado.*

Wooldridge, J. M. (2009). On estimating firm-level production functions using proxyvariables to control for unobservables. *Economics Letters 104(3): 112–114.*

WorldBank. (2010). *WorldBank World Development Indicators 2010 Database*.

WorldBank. (2014, July 08). Strengthening Export Performance through Improved Competitiveness. *3rd Ethiopia Economic Update*.

WorldBank. (2015b). *The World Development Indicators Database.*

WorldBank. (2017, April 04). *World Development Indicators*. Retrieved from http://wdi.worldbank.org.

WorldBank. (2017). *World Development Indicators: Structure of output.*

WorldBank. (2017). *World Development Indicators;Structure of output.*

Z.J, A., C, A., & Zhang.T. (2007). .The determinants of new-firm survival across regional economies: . *The role of human capital stock and knowledge spillover. Papers in Regional Science 86(3): 367–391*.

Zerayehu, S. E., & Peter, K. K. (2014). Modeling the Dynamics of Sectoral TFP Growth in Ethiopia;Explaining Persistent Economic Debacles. *American Journal of Business,Economics and Managment.Vol.2,No.5,2014,pp.144-162*.