Acknowledgement

It is through Mekelle University, Department of Economics that I got a chance to study under NOMA programme. It is my pleasure to thank all staff members especially Dr. Zenebe Gebre-Egziabher, Alem Araya and Dr. Gebrehawaria Gebre-Egziabher who particularly were responsible to let me have this opportunity.

I like to honour Norwegian University of Life Sciences that cover my living expense in the course of two years programme. I thank all the staff members who were keen to support me in every aspect I need especially Prof. Stein Holden who always lend me a helping hand.

My sincere appreciation goes to my advisor Dr. Simone Bauche whose critical look brings more clarity and quality to the study. I owe you a lot for the diligence you showed in helping me. Thank you!!

My heartfelt gratitude goes to Prof. Arild Angelsen, who was also my advisor, for his critical and persuasive comments and his dedication and support to me.
I have shared my first survey experience with NOMA students. We have spent a time full of experiences and challenges. I must now acknowledge all students for the time we spend.

I have a special place for Dr. Daan Ooms who was my teacher I this masters program at Mekelle University. You were treating me like a little brother, teaching me with integrity and respect. I can't repay but I must thank.

I am who I am because of my parents, Abay and Bancheye. I can't say I have passed through ups and downs and see this or that but life was enough to show me what I mean to them. It is through your love I stand and taste the world. My deepest affection goes to my family; Teddy, Diana, Lucas, Amare and Fenta. Selam, you always give me a peace of mind since I know you as a person. May God bless you all!!

Kibre_Ab

Table of contents

List of Tables

List of figures

List of Acronyms

ADLI	Agricultural Development Lead Industrialization
AIDs	Almost Ideal Demand System
CSA	Central Statistics Authority
AFDB	African Development Bank
EEA	Ethiopian Economic Association
EEPRI	Ethiopian Economic Policy Research Institution
EPRDF	Ethiopian People Revolutionary Democratic front
FAO	Food and Agricultural Organization
FDRE	Federal Democratic Republic of Ethiopia
IFPRI	International Food Policy Research Institution
ILRI	International Livestock Research institution
OECD	Organization for Economic Cooperation and Development

Abstract

Ethiopia is an economically poor country where large people in the abyss of poverty. The economy is mainly agrarian with traditional mode of production that has led to underdeveloped economy. These facts instigate the government to introduce an industrialization strategy, namely Agriculture Development Led Industrialization (ADLI), which gives priority to the growth of agriculture with an ultimate objective of realizing an overall industrialization process in the economy . The presumption that an agricultural growth will give a way to industrialization needs to be evaluated, as the country for 17 years has followed this strategy and after a decade of sustained agricultural growth.

One of the premises of ADLI is that a growth in agriculture will provide a domestic demand for manufactured goods, which was missing and dwarfing the growth of industrial sector. The thesis does not focus on the importance of creating domestic demand, but rather whether the consumption pattern of farm households' is likely to generate demand for manufactured goods as income grows.

To answer this question I have estimated the consumption function of farm households in Tigray using an Almost Ideal Demand System (AIDS) so as to identify how demand for manufactured goods respond to changes in income. To indicate the growth of income I have used the per capita expenditure level of households.

The estimation result shows that growth in per capita expenditure brings additional demand for durables but no significant change on manufactured goods. Income obtained from crop selling activities increase the demand for durables while income from hired out labor has a positive impact on demand for manufactured goods. Income from agricultural activities has strong positive inter-linkage with consumption of durables than manufactured goods.

Key Words: Industrialization, Agricultural Growth, Consumption Expenditure, Expenditure Elasticity, Manufactured Goods

1. Introduction

The Ethiopian economy is agrarian with 85% of the total labor force employed in the agricultural sector (Dercon, 2009; Samuel, 2006), and 50% of the GDP and 90% of exports coming agriculture (AFDB, 2010). For the past few decades (since 60s) the economy has not undergone remarkable structural transformation (Gudeta, 2009). With low level of economic development and high proportion of the population living under poverty, no precious metals and oil to export (Eyob, 2007), the country needs economic transformation to tackle the broad, deep and structural poverty and bring about sustainable development

(Sufian, 2002). An economic transformation will include change in the relative importance of sectors, mode of production and level of technological input use.

It is apparent that the Ethiopian economy needs transformation and structural change so as to evolve the people out an abyss of poverty. With consent on the need of an economic transformation an important question will then be how to achieve the needed transformation. The government of Ethiopia devised Agriculture Development Led Industrialization (ADLI) strategy. As the name implies the strategy aims first in realizing a growth in the agriculture sector. Then through inter-sectoral linkages, an initial growth in agriculture will be transferred to other sectors, specifically industrial sector, and an overall industrialization of the economy could be achieved.

The fact that virtually every country that experienced rapid growth of productivity and living standards over the last 200 years[1] has done so by industrializing (Murphy, 1989) makes it reasonable to pursue industrialization. There are questions, , however,, on bringing agriculture as the strategic sector and on premises that the strategy has put as granted.

The government believes that faster growth and consequential economic development can be achieved if the country adopts a strategy that helps raise the employability of labor resources and enhance productivity of land resources aimed at capital accumulation (Sufian, 2002). Hence, development is expected to be agriculture led development. Growth in agriculture would allow for an increased demand for non-agricultural products, release of labor and a surplus for investment in other sectors (Dercon, 2009).

Two different but related questions arise immediately. First, is it possible to achieve the required growth from agriculture? Real GDP growth averaged 11.2% per annum during the 2003/04 to 2008/09 period, placing Ethiopia among the top performing economies in Sub-Saharan Africa. From 2003 to 2008, the agricultural sector in average grows at 10.7% (AFDB, 2010). Performance of the agricultural sector has a strong correlation with GDP of the country (Zerihun, 2009), not surprisingly since half of the GDP is from the agricultural sector. Hence we can accept that in the past decade the agricultural sector has shown growth. Further, there is still a debate on the source of growth, with some researchers claiming agricultural growth comes from increase in the cultivated area instead of productivity improvements (AFDB, 2010; (Samuel, 2004). The empirical studies are not conclusive on this issue.

The second question is, if the country achieves agricultural growth, is there a strong inter-sectoral linkage that could allow a growth in other sectors? In other words, to what extent

---

[1] *The timing is from the publication of the quoted book.*

will high agricultural growth stimulate high growth in non-agricultural sectors?

With agricultural growth and farm household's income increment, an increase in the demand for manufactured goods and technology intensive agricultural inputs is expected. Woldehanna (2008) argues that the current agricultural system is too traditional to create enough demand and even so, the demand for modern inputs is small and satisfied by imports (such as fertilizer and insecticide). Only 5% of intermediate inputs demanded by agriculture are produced by the domestic manufacturing industry (Ethiopian Economic Association 2005, 7) (in Altenberg 2010). These findings show that demand for manufactured agricultural inputs is not sufficiently large to be hopeful in achieving industrialization. But what about demand for consumption manufactured goods? Will growth in per capita income of farm households also generate demand for manufactured goods?

This thesis aims to identify the consumption pattern of farm households, especially the demand for manufactured goods, to answer how much of total expenditure is spent on manufactured goods. I have estimated expenditure elasticity of manufactured goods which informs potentially how much additional demand could be generated from agriculture sector if farm households' income increase.

Objectives:

The objective of this paper is to assess the links between small holding agriculture and the manufacturing sector. I evaluate the premise of the ADLI strategy which says a growth in the agriculture sector can be transferred to other sectors through increased demand for manufactured goods.

The research aims to answer:
- How much of the consumption expenditure is spent on manufactured goods?
- What factors determine the consumption of manufactured goods?
- How does demand for manufactured goods respond to changes in price and total expenditure?

2. Literature Review and Theories
2.1 Literature Review
2.1.1 Concept of Agricultural Development led Industrialization

According to Hirschman (1958) a nation seeking industrialization should prioritize growth of an industry with a strong backward linkage (Vogel, 1994). By backward linkage it is to mean an input demand of the industry`s production process. Strategic intervention in a sector with strong backward linkages will stimulate an economy. The sector with a strategic importance is to be given a special emphasis; this indicates that the development approach by Hirschman is that of `unbalanced growth` (Vogel, 1994).

Agriculture, in comparison to industrial sector requires less variety of inputs. This implies the backward linkage of the agricultural sector is weaker than for the industrial sector. Hence, agriculture should not qualify to be the strategic sector in the unbalanced growth approach (Hirschman, 1986). Despite backward linkage, however, agriculture may serve as a strategic sector if it could provide wide domestic market which arise the need to evaluate the consumption behavior of farm households.

In the strategy of ADLI, agriculture is given a special emphasis; as the name suggests industrialization is to be achieved after and through the development of agriculture. Therefore, it is unbalanced in nature, as proposed by Hirschman. , however,, it prioritized agriculture which is not in line with Hirschman. Hence, we could say that the strategy of ADLI is based on unbalanced growth but favors agriculture.

In the famous dual economy theory of Lewis it is stated that a surplus labor that could be transferred from the traditional sector (mostly agriculture) to the modern sector (industrial) is a cornerstone in the development process (Lewis, 1954 in Ray, 1998; page: 353-357). Ranis and Fei extended the duality theory of Lewis and state that economic development proceeds by the transfer of labor from agriculture to industry and simultaneous transfer of surplus food production, which sustains that part of the labor force engaged in non-agricultural activities (Ranis and Fei, 1961 in Ray, 1998; Page: 363-367). Further, ample supply of food would keep food prices low, and therefore industrial wages low, which again increase the profit to be reinvested in the industry.

It seems reasonable to assume that the backward linkages of the agricultural sector are weaker than those of the industrial sector. According to Mellor, however, consumption linkages are most important. ... "[Rural people] will spend at least 70 percent of their incremental income on consumption goods" ((Mellor, 1995) in Dercon, 2009; page 24). A growth in agriculture will therefore increase disposable income among farm households. Increased expenditure by these farm households will boost domestic demand and open a market for domestic industries.

The idea of prioritizing consumption linkages than backward linkages will make ADLI more of *saving constrained industrialization (Banerjee, 2000).* In saving constrained strategy it is not availability of capital that brings a momentum to industrialization. Rather, the ability of an industrial sector to produce an item likely to be consumed by the rural people will bring a symbiotic relationship between the agricultural and industrial sectors. If the manufacturing sector is able to generate domestic demand, we could say it is the sector (industry) that mobilizes resources, not the capital resource that brings industrialization.

According to Banerjee (2000), such a strategy is more similar with community-based neo Industrialization. This is an industrialization in which modern outward looking industry develops in a symbiotic relationship with some existing community: the industry succeeds where others would not, because it is able to draw on the preferences of some close knit communities which increases consumption wellbeing within the community and makes contracts between members of the community easier to enforce (Banerjee, 2000; page: 1).

An important question is whether an increased income will generate domestic demand and there are two related arguments in favor of agriculture. The first one is the `real income` hypothesis. The expenditure stimulus is derived from real resources, not monetary expansion, so there are real goods to be purchased as factors of production are mobilized in other sectors by the increased expenditure (Mellor, 1995). The fact that Ethiopia's economic growth has been ongoing leads us to ask how growth of agriculture and farm households' income will make an impact on the consumption of manufactured goods. This argument is strengthened by the permanent income hypothesis of Friedman, which says that individuals adjust their consumption in response to a permanent increment in their income (Friedman, 1957).

The second argument relates to the country's endowment. With a large proportion of labor force in the agricultural sector and a large area of arable land we can say Ethiopia has a higher potential for agriculture than industry. To achieve structural transformation (a transformation from agriculture dominance to industrialization) in economies at low stage of development, it is necessary to increase agricultural income and expenditure and rapidly increase labor productivity in agriculture, which will further accelerate structural change in the employment distribution of the labor force (Mellor, 1995).

2.1.2 Characteristics of Ethiopian Agriculture

Agriculture in Ethiopia is dominated by smallholders where over 85% of farmers cultivate less than 2 hectares. In the 2000 cropping season, 64.5% of the total rural households operated less than one hectare; while 40.6 % operated farms of 0.5 hectare or less (CSA, 2002; Workenh, 2005). Such farms are fragmented on average into 2.3 plots. About 11% of farmers were reported to be landless in 2002 (EEA, (2002) in Samuel, 2006).

The country`s land policy restricts selling and buying of agricultural land. Moreover, a farm household is not allowed to leave the area of her agricultural land for more than two years, if they do they risk confiscation. This fact highly limits the mobility of farm households (*(EEA/EEPRI, 2002) in Samuel, 2004)*. With a high rate of rural population growth of 2.6% in 2009 (Tegenu, 2009), which is larger than the world average of 1.2% (World Bank, 2011), the size of land holding is expected to decline further in the future.

Studies focusing on the impact of land holding size conclude that it has a negative impact on labor (if not land) productivity. Small land size is major impediment for the application of production technology. The quantity of input use in Ethiopia is directly proportional to holding size (Wolday, 1998; Mulat et al, 1998) in (Zerihun Gudeta, 2009). This fact associated to the average holding size in Ethiopia, leads to low land productivity.

Another study by Nega (2003) (in Samuel, 2004) shows that Ethiopian agriculture shows a declining trend for over 40 years[2]. One decade (10 years) of the studied years is after the ADLI strategy was launched by the EPRDF regime. The study pointed out that a declining trend in the productivity of agriculture is a manifestation of the structural weakness of the sector.

As shown by (Wolday, 1998; Mulat et al, 1998), small land holdings have small adoption of technological inputs, one indication being high reliance on rain fed agriculture. A macroeconomic time series study by Geda and Degefe (2005) shows the domestic output in general, and agricultural output in particular, is highly correlated with weather outrun. Ethiopian agriculture is almost exclusively dependent on rainfall, given that irrigated agriculture accounts for less than 1 percent of the country's total cultivated land (Yesuf et al, 2008; Sufian, 2002).

The current situation, characterized by declining land productivity, low labor productivity and reliance on rainfall make Ethiopia's agriculture unreliable as a source of livelihood. Overall in the country, 77% of the farmers who store grain sell it in about a month's time (see EEA, forthcoming report) in (Samuel, 2006). With one rainy and production season therefore, most farmers will not have a surplus after one month of harvesting time spend 11 months of a year without a surplus.

It is not only the agricultural output that is based on subsistence. Most farmers do not have off farm income generating opportunities. Average household income from farm and non-farm activities satisfies only 59% of basic food and non-food needs for the average smallholder farmer (see EEA forthcoming report on Extension Study) in (Samuel, 2006)

---

[2] *The time duration is since the publication year of specified study (2004)*

In general, average per capita grain production in Ethiopia fluctuates between 106 and 165 kilograms in the past decade which on average indicates a deficit of 60 to 100 kilogram of grain per person (a result obtained by "Food Gap Analysis Method" from (Zerihun, 2009). Low productivity and income severely constrain rural demand for manufactured products, and only 5% of intermediate inputs demanded by agriculture are produced by the domestic manufacturing industry (Ethiopian Economic Association 2005, 7) (in Altenberg 2010).

2.1.3   Inter Linkages of the Rural Sector in Ethiopian Economy
A. Consumption Pattern of Rural Households

The consumption composition of farm households shows that 75% of all consumption expenditure is food. Households' subsistence consumption covers close to half of total expenditure. A report by World Bank shows that in the 1997/98 production season (and the consumption expenditure for the whole year[3]) 45% of food consumption is subsistence and 53% cash expenditure consumption[4] (World Bank, 1998). Major rural household expenditure items of farm households (beside food) include; clothing (8%), ceremonials and contributions (6%), medical expenses (2%), schooling (<1%), transport (2%), household durables and building materials (2%), and other expenditures (4%) (World Bank, 1998).

The fact that food covers the largest proportion of consumption expenditure has an implication on demand for manufactured goods. According to Engle's law of consumption demand for food is expenditure inelastic because food is a necessity item that people consume in priority (even more necessity than other necessities like cloth and shelter) and the percentage of income allocated for food purchases decreases as income rises (Deaton, 1998). The agricultural households spend little of the incremental income on increased consumption of basic food staples (Dercon, 2009). As a household's income increases, the percentage of income spent on food decreases while the proportion spent on other goods (such as luxury goods) increases.

 The income elasticity measures the responsiveness of demand for a product to changes in income, that is, the percentage change in demand for a product divided by the percentage change in income[5]. The major item next to food in the consumption basket of households

---

[3] 1997/98 is equivalent to the year 1990 according to Ethiopian Calendar. They relied on Ethiopian Rural Household Survey Data for their estimation. Hence the survey fully covers one production season.

[4] Subsistence consumption defined in this thesis as a consumption from households' own production

[5] According to a review made by Udry (1995) , however,, most of the time estimations of expenditure elasticity are likely to be overestimated. One has to be careful in taking those values (values of elasticity) if the magnitude is of special importance. In this thesis , however, considering the maximum possible elasticity (maximum because it may be overstated) will not bring complications in dealing with the objective of the paper.

is cloth. Hence it is expected that the expenditure elasticity demand of cloth (mainly a manufactured item) will be higher.

Consumption behavior of farm households is, however, only one side of the market. There should be a responsive industrial sector that provides commodities preferred by farm households at affordable prices. A study by Dercon in Ethiopia shows that consumption linkages are not exogenous to the supply side of the market; that is availability of suppliers of manufactured goods in a locality will also influence consumption behaviour of residents in the locality (Dercon, 2009). Availability of suppliers also influenced by the potential demand thought to exist in the minds of entrepreneurs. Unless with non existence a flexible and responsive manufacturing sector to changes in demand, a study aimed at evaluating potential demand will likely miss half the story. This assertion is consistent with the theoretical underpinning that productivity improvements in commercial manufacture make farmers substitute manufactured goods produced locally for manufactured goods produced by a commercial sector (which have now can offer lower price due to productivity improvements) (Weisdorf, 2006).

B. Multiplier Effects of Agricultural Growth

We have seen the consumption linkages of farm households in section 2.1.3 (A). Consumption linkage is the link formed by farm households consuming industrial products and urban people consuming agricultural commodities. In this thesis the emphasis is on consumption of manufactured goods by farm households. It is argued in some studies, notably (Diao et al, 2007) and (Woldehanna, 2002), that consumption linkages represent the strongest form of linkages in Ethiopia and Tigray, respectively. Assessing the potential from the income level of farm households and the respective marginal budget share of manufactured goods (Dercon, 2009) concluded that agriculture in Ethiopia cannot, at current levels of income, be expected to play the role in stimulating other sectors as it would in other countries.

An agricultural growth creates two sided production linkages: backward- demand for inputs due to new activity, and forward linkages- emerging new activities in other sectors due to increased production (Delgado, 1998). Considering only of production linkages the agricultural sector will likely have lower linkages than an industrial sector, for the reason that crop production requires less processing than industrial sector (Subramaniam, 2010).

However, according to dual theory of development of Arthur Lewis, the traditional sector which is characterized by subsistence agriculture has large labour force with low or zero productivity. At this state shift of surplus labour from the traditional sector will not lower total production, instead will create cheap supply of labour for the industrial sector (Ray, 1994). An increased income among the rural households will help to accumulate capital

accumulation.

Another dimension of inter-sectoral linkages is from an increased income among farm households. First, households will consume more and create consumption demand for other sectors. The other possible role is capital could be accumulated and invested in other sectors (Delgado, 1998).

(Diao et al, 2007) shows through a fixed price semi input-output model that on average (average for different agricultural commodities) a 1 birr[6] increase in teff[7] production will generate 0.61 birr direct increase in GDP because of consumption or input demand. The total direct and indirect impact of a 1 birr increase of teff production on GDP is 2.18 birr. The statistic is not conclusive to say the consumption demand is either higher or lower, because there is no comparison group; which would have been possible with a time series data or a cross sectional country with similar economic characteristics with Ethiopia. One thing we should note from the same study is that the overall impact of an increase in teff production is higher than impact of an increment in the production of cloth (1.41) and lower than the overall impact of major exporting item of the country, coffee (3.45).

2.2 Variables that influence Consumption Behavior of Farm Households

One of the influencing factors to consumption behavior is income of the household. Income, , however,, is controlled for since per capita expenditure and price index of each consumption group are integral part of an AIDS model. Other household and village characteristics that could possibly influence consumption are listed and discussed below.

2.2.1 Market

In general, markets available for rural farm households are far from perfect. Especially consumption of manufactured goods has to be accessed from outside the locality and hence market will appear as an important variable. Braun (2007) notes that small and medium-sized towns play an important role as an intermediary point along the rural-urban continuum, linking and benefiting both rural and urban areas through consumption, production, and employment patterns as well as various types of economic and social provisions (e.g., Satterthwaite and Tacoli 2003; Wandschneider 2004) in (Joachim Braun, 2007).

Poor access to urban markets will dampen any potential stimulant effects to the economy (Dercon, 2009). A market improvement, in line with strengthening and improving the

---

[6] *Birr is the currency of Ethiopia, and all figures in the descriptive and econometric analyses of this paper are in birr.*
The exchange rate of birr to dollar at the time of data collection was 1 USD= 13.6047 birr
[7] *An annual grass (Eragrostis tef) common and native to the highlands of Ethiopia that produces a small grain*

agriculture sector, will also bring broad based non-agricultural growth (Xinhen Diao, 2007). Hence distance of Local, Tabia[8], Distant, and Woreda[9] markets from the residence of households will indicate access to markets.

2.2.2 Infrastructure: Roads and Transport

In general, a better infrastructure will increase linkages across different areas and sectors. It will bring timely and reliable distribution of goods from production to consumption sites. Better infrastructure can lead to a relocation of tradables to cities and towns, reducing the density of such activities in rural areas (Deichmann et al, 2008).

Infrastructure investments (in particular roads) will make rural areas more accessible which will in turn create increased competitiveness among local merchants (de Janvry, et al, 1991). Ethiopia is a landlocked country. There is no any railway line or water transport in the study area. The common mode of transportation is road and pack animals. Hence, distances to an all weather road will one indicator of infrastructural facility.

Pack animals (camel, donkey, mule, and horse) also serve as an important transportation systems. A household`s possession of these animals can be a good indicator of transportation options. Hence distance of farm households' residence from an all weather road and possession of pack animals as measured by Tropical Livestock Unit (TLU)[10] is included in the estimation.

2.2.3 Migration/ Remittances

Individuals' decision to migrate can be in response to different household strategies. In some especially drought prone households, young members might be sent to relatives mainly to elder ones. The rationale behind this is to reduce the family size, and along with the level of consumption (Ezra and Kiros, 2001). We can deduce two things from this assertion:

  i. Household size influences the household consumption decision.

  ii. One rationale behind migration could be to reduce the number of consumers (especially dependents) in the family.

This migration type, apart from reducing the household size may not have an income

---

[8] *Tabia is an administrative unit beneath Woreda*

[9] *Woreda is an administrative unit beneath zone*

[10] *I have used the rate used by International Livestock Research Institute. Pack animals include donkey (0.5 TLU), Mule (0.7 TLU), Horse (0.8 TLU) and Camels (1 TLU) Source: FAO* http://www.fao.org/wairdocs/ilri/x5443e/x5443e04.htm

effect. It is reflected in the study that most of the time the migrants are young with no prospect of remunerative activities.

The other rationale of migration could be a strategic investment on the migrant. From the work of Stark and Bloom (1985[11]) it is found that migration is a household decision and families invest in a migrant (or migrants) in return for future receipts of remittances (Bran, 2007). In this case it is potentially labor force that is to migrate in promise of higher income and will have different impacts on the consumption of households.

i. Remittances can play a very important role in supplementing incomes in receiving households (Braun, 2007). The additional income could play a stimulant impact in the local economy only because it is additional income. According to (Dercon, 2009) the additional income will have even higher impact in the local non-farm economy than it would have been with additional income from the agriculture sector. The assertion is that referring to the work of (Diao et al, 2007) wage earners and entrepreneurs spend less to food staples and more on industrial items than farm households.

In such cases, therefore, a member (members) who migrate will influence the members in the family to change, in some way, their consumption behavior.

ii. The other influence that migrants will make is on members' consumption decision at the origin. Higher interaction entails continued (rural-urban) interaction between migrant(s) and their families, who remain in the area of origin in (Joachim Braun, 2007). The interaction will bring market information, and may lower transaction cost of buying manufactured goods for the reason that migrant members may send remittances in kind as well.

To incorporate the effect of mobility of farm members, migration income and remittance income is included as non-agricultural income dummy. The basic difference between remittances and migration income is that migrant is periodically (non-peak agricultural season) employed in nearby towns and the migrant is a member of the household. Remittance, however, involves transfer from a relative who has migrated on a non periodical, but not necessarily permanent, basis. The distinction is, however, not much clear that I incorporate these two variables as one dummy variable. In addition, income from hired out labor, hired out to an agricultural activity in the dame are, which is numeric is separately included.

2.2.4 Crop Production

An increased income of farm households could come from farm or nonfarm activities. The

objective of identifying expenditure elasticity consumption of manufactured goods by farm households is to compute the effect of agricultural growth on creating increasing demand. Hence, positive expenditure elasticity does not necessarily mean the effect is from agriculture.

We have to separate the increased income in to two groups: the one that comes because of agricultural production and from other sources. The variable will, however, create high correlation with consumption expenditure. There for it will be better to treat it with additional information about net purchase (net buyer or net seller) of agricultural commodities.

Relative price may affect the consumption pattern of households. Being net seller or net buyer will affect the mix of consumption between own produced staples and other items.

2.2.5 Education and Age of household heads

Average education level of household members is found to affect the consumption pattern of households (World Bank, 1998). With education a household will be more interactive to outside environment and become aware of market information. Hence it is wise to investigate if educational level has an impact on the consumption pattern of farm households.

The age level of households may also have an impact. The assertion is that relatively young households are more likely to adjust their consumption towards changes in supply (Farooq, 1999). Old households who may develop a certain consumption habit may be conservative to change their consumption.

2.2.6 Other Income Sources

A study made by (Sosina et al, 2011) in the rural households of Ethiopia to identify the capability of nonfarm income in bringing mobility among farm households indicates that non-farm income has some distinct features in comparison with farm income. In addition to bringing economic growth consumption expenditure growth is positively correlated with initial share of non-farm income (Sosina et al, 2011).

The study shows that nonfarm income has an effect of relaxing liquidity constraint. A study by (Whitaker, 2009[12]) also reveals households` decision making on consumption differs for different sources of income. One important difference noted by the study is that usually households consider reinvestment when it comes to an increased farm income. Reinvestment is not, however, considered for reinvestment.

---

[12] *This study is conducted in USA rural households to identify the response of rural households in response to government payments.*

This may not be necessarily the case for rural households in Tigray. However, it is worth looking for any systematic impact of non-farm income on the consumption mix of manufactured and agricultural commodities.

3. Data and Methods

3.1 Study Area and Data Source

The study is conducted in the Tigray region, one of the nine administrative regions of Ethiopia. Tigray region is located in the Northern part of Ethiopia, and borders Eritrea in the North. It has a total population of 4.3 million, of whom 80.5% (3.46 million) are living in rural areas. The main source of income for rural population is small-scale agriculture.

The Norwegian University of Life Sciences, in collaboration with Mekelle University of Ethiopia conducted economic surveys in different rural areas of Tigray region. Sample areas are taken from different administrative zones in a way to incorporate different agro climatic regions.

The survey was launched in 1998, and since then five rounds of panel and cross sectional data have been collected in 1998, 2001, 2003, 2006, and 2010.

In this study a panel data of two years (2006 and 2010) is used. The 2010 survey was conducted on June 2010 and the researcher participated in field work, data entry and cleaning processes.

Tigray has five different zones named with their relative geographical locations; Central, Southern, Western, Eastern, and South Eastern Tigray. The survey is conducted in all of the five administrative zones of the region.

From a total of 35 Woredas[13] in the region, the survey includes 11 Woredas: 3 from the Central zone, 3 from Eastern Zone, 2 from South Eastern, 2 Western, and 1 from Southern zone. The main consideration in the process of sampling is to incorporate different agro climatic conditions of the region.

---

[13] *Woreda is an administrative unit below zone*

Figure 1: Administrative Woredas of Tigray Region, Ethiopia.
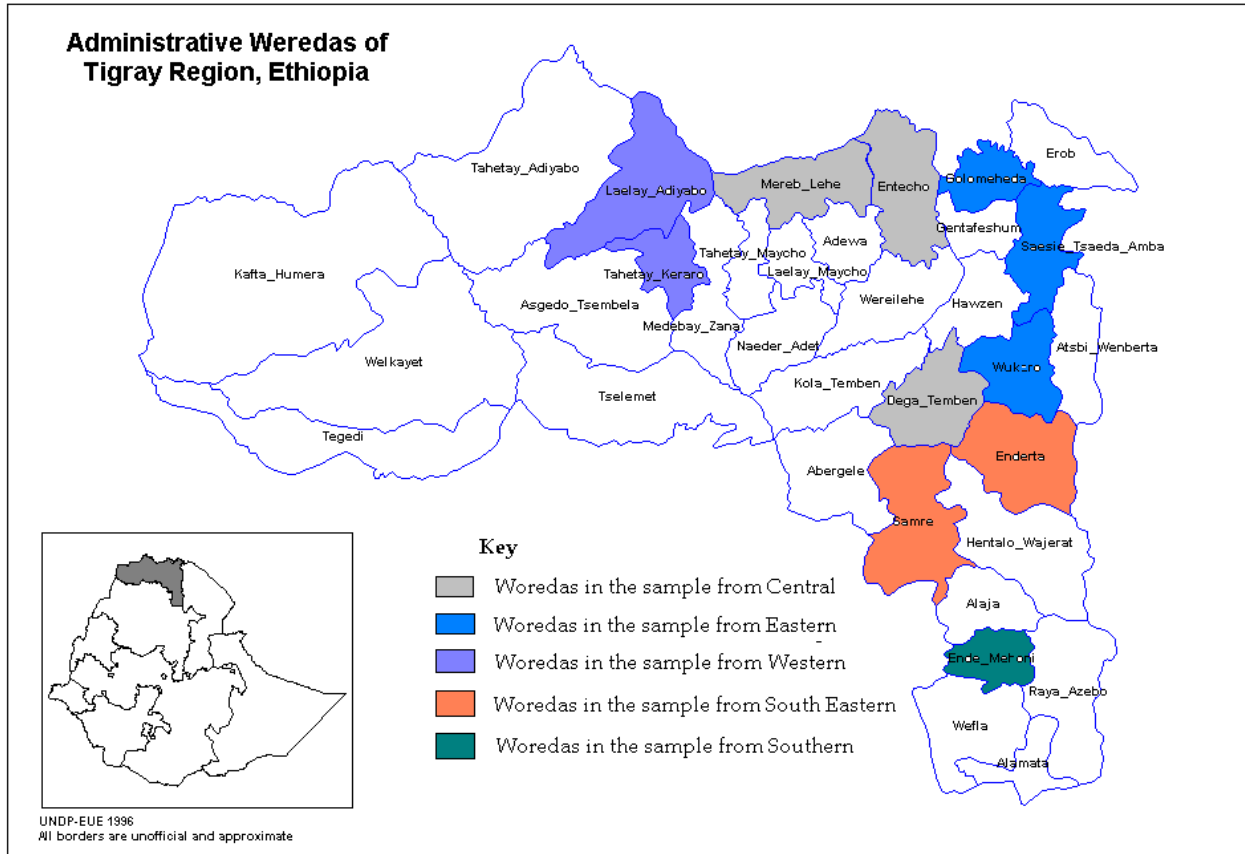
According to the administrative structure of the region, the lower unit next to Woreda is Tabia. From 11 Woredas 18 Tabias were selected from which a sample of 516 households were included. Average family size of households is 4.98 and a total population of 2570 is included in the sample.

The relevant part of the survey for this study is mainly the household[14] questionnaire. We have collected data on annual expenditure of households. The information includes the kind of commodity they purchase, price, the place of purchase (a market in the Tabia, distant market etc), distance to the market.

The data is recorded based on recalling capacity of households. We have first listed all commodities that are sold, bought and consumed in the area. The questionnaire has been used since 1998, and local information obtained through the years and knowledge of community members is exploited to include all economic goods.

Heads of household are asked how much of a commodity they consume either within a week, a month or any time period convenient to their recalling. The questionnaire also asks

---

[14] *Other parts of the questionnaire include Perception, Plot, Community and Experimental.*

where they consumed, how they travel, the unit of measurement, how much of it is from the market and how much from own production.

All the figures were converted in to a common unit. Total consumption is measured per year. Price of commodities is converted in to a consistent unit for all households, kg for weight, liter for liquid etc.

Data collection Methods

The questionnaire's format has been used before. In general the questionnaire is divided in to three main parts: household questionnaire (which emphasizes on household demography, consumption, crop selling, livestock ownership etc), plot questionnaire (which is about plot level data; plot size, type of soil, investments on plots, distance of plots from residence area etc), and perception questionnaire (which is about the households' perception about land policies, land contractual arrangements, etc).

The main sample questionnaire comprises the above three groups of questionnaire. There is also a community level questionnaire which aims at collecting secondary data and local information from officers, local authorities, and land administration committees.

The mode of data collection chosen is interview by trained enumerators, who can speak Tigrigna (the local language) and English. Enumerators communicate with local people in Tigrigna and record the response in English format. Two enumerators undertake the data collection under the guidance of one student from the Norwegian University of Life Sciences.

Methods to Improve the Accuracy of Data

People with a wealth of experience in field survey were extensively participating in the data collection process. An orientation was given for students as well as enumerators before the data collection; mainly about the contents of the questionnaire, possible issues and problems to be encountered, common mistakes in previous surveys, how to methodically extract as much information as possible from respondents, how to better communicate with local people and authorities etc.

Pretesting was first held in an area which has been extensively used in previous studies and respondents were not cooperative. Then a pretesting is made in relatively fresh area to the survey. At the time feedbacks were collected about the questionnaire, common mistakes likely to be created by enumerators, problems encountered and the best way forward etc.

Enumerators were assigned after passing a qualifying interview made by the supervisors. Preference was given to enumerators who have been participating in previous surveys; and who know the contents of the questionnaire as well.

The scope of the survey questionnaire is wide and it consumes a lot of time. The

respondents were paid a compensation for the time lost which will make them more cooperative. It should also raise the willingness to answer for the questions seriously. Moreover, to avoid tiresome from the respondents, interview of different parts of a questionnaire was scheduled to take place in different days.

Previous experiences by the supervisors show that a visit to the residence of households helps to avoid a possible mischief by the respondents. To gain the advantage of conforming a response given by the respondents and facts; facts about house, livestock, toilet, etc the interview was held in the compounds if not home of respondents.

Students provide a thorough cross check of the whole questionnaire immediately after the questionnaire is filled by the enumerators. Incomplete or inconsistent data will be corrected in the mean time.

3.2   Estimation Methods

To estimate the potential of agriculture in providing a demand base for manufactured goods we can estimate the elasticity of this commodity group and evaluate the consumption pattern that farm households follow. We derive the expenditure elasticity of consumption of manufactured goods by using an Almost Ideal Demand System (AIDS)[15]. Its features of local flexibility, the possibility of imposing restrictions on parameters and robust estimates even in cases of high elasticity of substitution (Gordon, 1993), allowing goods to be luxuries or necessities depending upon household characteristics (Verbeek, 2004) makes this demand system desirable.

Gordon et al (1993) used the same model to estimate the consumption pattern of farm households in Kansas (USA). They have estimated the average budget shares, marginal budget shares and then income elasticity of consumption for different commodity groups. The estimation is made with 12 years of panel data and they have used price indices specific to each income groups. The basic rationale behind is that more or less, people in a given income group will behave similarly and that they will consume similar items. If that is the case the price index, which is in addition to price, a function of types and quality of products will better represent a specific income group than the whole consumers. As can be seen from the model price appears as a main component of the model:

$$\ln m(U,P) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln P_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \ln P_i \ln P_j + u \beta_0 \prod_{i=1}^{n} P_i^{\beta i}$$

(3.1)

---

[15] *(Browne, 2007; Carriker, 1993; Farooq Panel data; 1999) use panel data to estimate consumption function using an Almost Ideal Demand System. (Teklu, 1987; Golan, 2001; Adusei et al, 2008; Jabarin and Al-Karablien, 2011) estimate the demand system using cross sectional data. Jabarin and Al-Karablien, 2011state that they have used cross sectional (instead of panel data) because of data limitation.*

Where, $m(U,P)$ refers to an indirect utility function of U- Utility level and P- general price index,

$\ln P_i$ - Natural logarithm of price index (P_i) which is calculated by the Stone-Geary formula of price index:

$$\ln P = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln P_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \ln P_i \ln P_j \qquad (3.2)$$

Price index of a specific commodity group

β_i - Budget share of a commodity group

n- Total number of commodity groups

$\alpha_0, \alpha_i \gamma_{ij}$ and β_0 are parameters to be estimated from the model.

The indirect utility function reflects the highest possible level of utility that the consumer could achieve given his income m and level of price as represented by the general price index P. The level of utility is determined by the price of each commodity P_i in the consumption bundle of the consumer and prices of related goods P_j.

The demand function in terms budget shares can be written as:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln P_j + \beta_i \ln\left(\frac{M}{P}\right) ; \text{ Where,} \qquad (3.3)$$

w_i - The budget share of a commodity group `i`

M - is per capita income

P - is a general price index for all commodities

P_j - Price of related goods for the cross sectional period assuming the price to be the same for all households in a given period of time

Gordon et al (1993) have used price indices obtained from the USA Labor Statistics for estimation. Calculating price indices and following the same procedure in my study area is problematic. Manufactured goods include many types of commodities with differing qualities and prices. The household decision of purchasing a commodity includes the quality as well; and in the condition that standardized products are hardly existing computing a single price index and relying on it will become arbitrary. Hence I have calculated a Stone- Geary price index to each consumer based on the price they reported to have paid to each commodity during the transactions.

Hazell and Roel (1983) have used a different approach in the same demand system, which did not require the computation of price indices. In the study carried out in Nigeria and Malaysia, they estimate marginal budget share of different consumption groups including total foods, locally produced nonfood, and total non tradable. This approach includes

other characteristics of households that are theoretically expected to influence the consumption decision of households. Taking a cross sectional data and accepting that prices of commodities are the same for all households in a given time period we can rule out the need to calculate price indices (Verbeek, 2004) (Hazell and Roel, 1983).

The model is:
$$E_{iX} = \alpha_i + \beta_i E_X + \gamma_i E_X \log E_X + \sum_X (\mu_{iX} Z_X + \lambda_{iX} E_X Z_X)$$
(3.4)

Where,

E_{iX} - is total expenditure on a commodity group of interest,

E_X - total expenditure of household X

Z_x - other household characteristics that influence consumption of the commodity group i and

$\alpha, \beta, \gamma, \mu$, and λ are constant parameters to be estimated.

This model is susceptible to problem of heteroscedasticity because the variation in expenditure for a commodity group is expected to be higher with high levels of consumption expenditures. Taking the budget share rather than expenditure level will remedy the problem despite a loss of R^2 (Hazell and Roel, 1983).

$$S_{iX} = \beta_i + \frac{\alpha_i}{E_X} + \gamma_i \log E_X + \sum_X (\mu_{iX} \frac{Z_X}{E_X} + \lambda_{iX} Z_X)$$
(3.5)

Where, $S_{iX} = \dfrac{E_{iX}}{E_X}$ is the budget share of a commodity group

Taking the first derivative of equation (3.5) with respect to 'E_X' will give as a marginal budget share of the form:

$$\frac{\partial E_{iX}}{\partial E_X} = \beta_i + \gamma_i (\frac{\partial E_X}{\partial E_X}) \log E_X + \gamma_i E_X (\frac{\partial \log E_X}{\partial E_X}) + \sum_X \lambda_{iX} (\frac{\partial E_X}{\partial E_X}) Z_X$$

$$= \beta_i + \gamma_i (\log E_X + E_X (\frac{1}{E_X}) + \sum_X \lambda_{iX} Z_X$$

$$\frac{\partial E_{iX}}{E_X} = \beta_i + \gamma_i (1 + \log E_X) + \sum_X \lambda_{iX} Z_X$$

$$MBS_{iX} = \beta_i + \gamma_i (1 + \log E_X) + \sum_X (\lambda_{iX} Z_X)$$
(3.7)

Dividing the same equation (equation 3.5) by E (total expenditure) will give us the average budget share. Then we can calculate expenditure elasticity by dividing the marginal budget share equation with the average share:

$$\xi = \frac{MBS_X}{ABS_X} = \frac{\beta_i + \gamma_i(1 + \log E_X) + \sum_X (\lambda_{iX} Z_X)}{\beta_i + \dfrac{\alpha_i}{E_X} + \gamma_i \log E_X + \sum_X (\mu_{iX} \dfrac{Z_X}{E_X} + \lambda_{iX} Z_X)}$$

(3.8)

A mathematical computation of elasticity in different consumption groups; by classifying total expenditure into quintiles or deciles will help to identify if there is a meaningful difference in different income groups.

3.3 Empirical Models

To estimate the expenditure elasticity of households demand system, the following model is employed[16]:

$$w_i = \alpha_i + \sum_{i=j=1}^{3} \gamma_{ij} \log P_j + \beta_i \log[\frac{M}{P}] + \sum_{h=1}^{8} \theta_h Z_h$$

(3.9)

Where, w_i - budget share of each commodity group

$\quad$ P_j - Price index of consumption group j

(Formula of a Stone Geary Price index: $P_{cg} = \prod_{i=1}^{n} P_{cgi}^{wi}$)

$\quad$ M- Per capita income of a household

$\quad$ P- General Price index

$\quad$ Z_h - Household characteristics that affect consumption share of commodity groups

$\quad$ And α_i γ_{ij} β_i θ_h are parameters to be estimated.

$\quad$ P_j - Price index of consumption group j

$\quad$ (Formula of a Stone Geary Price index: $P_{cg} = \prod_{i=1}^{n} P_{cgi}^{wi}$)

$\quad$ P_{cg} Price index of a consumption group

$\quad$ P_{cgi} Price of a single commodity 'i' in a consumption group

$\quad$ w_i Expenditure share of the commodity (a single) from total expenditure of the

---

[16] *The format of this model is mainly taken from Farooq, et al, 1999*

commodity group

I have calculated a price index for each commodity group based on the share of each commodity. Price index of manufactured goods, for example computed as follows:

First the budget share of each of the seventeen manufactured commodities is calculated. Second the index is calculated using the formula $P_{manu} = \prod_{i=1}^{17} P_{manu,i}^{\delta i}$, where, δi is budget share of the ith manufactured goods from total expenditure for manufactured commodity group.

The same model is estimated twice; first with three commodity groups and second with five commodity groups. In the first case, I have treated all manufactured goods as one. Second, I tried to classify manufactured goods in to manufactured foods and manufactured cloth. The main rationale is to see differences and similarities in the demand system of manufactured food and manufactured cloth.

Manufactured food can be either substitute or complementary to consumption of manufactured foods; while it is unrelated to consumption of cloth. The expenditure elasticity for manufactured cloth could be higher than expenditure elasticity of manufactured goods which is more of necessity than cloth.

3.3.1 Model One

In the first model the whole commodities in the consumption bundle of households is divided into three main parts: agricultural commodities, manufactured commodities, and durables (see Annex 1 for a complete list of commodities in each group).

The budget share of each commodity group refers to the share of expenditure that agriculture, manufactured or durables compose from total expenditure. Based on this classification we have three different budget share equations:

$$w_{agri} = \alpha_{agri} + \gamma_{agri,agri} \ln P_{agri} + \gamma_{agri,manu} \ln P_{manu} + \gamma_{agri,asset} \ln P_{asset} +$$
$$\beta_{agri} \log[\frac{M}{P}] + \sum_{h=1}^{8} Z_h + ei \tag{3.10}$$

$$w_{manu} = \alpha_{manu} + \gamma_{manu,manu} \ln P_{manu} + \gamma_{manu,agri} \ln P_{agri} + \gamma_{manu,asset} \ln P_{asset} +$$
$$\beta_{manu} \log[\frac{M}{P}] + \sum_{h=1}^{8} Z_h + ei \tag{3.11}$$

$$w_{asset} = \alpha_{asset} + \gamma_{asset,asset} \ln P_{asset} + \gamma_{asset,manu} \ln P_{manu} + \gamma_{asset,agri} \ln P_{agri} +$$
$$\beta_{asset} \log[\frac{M}{P}] + \sum_{h=1}^{8} Z_h \tag{3.12}$$

Agri- Agriculture, Manu- Manufactured, and Durables

Z_h[17]- household characteristics that determine consumption pattern

P_{agri} -refers to price index of agriculture (Carriker et al, 1993; Farooq et al, 1999; Golan et al, 2001;).

Equation (3.10)The first equation is budget share of agriculture as determined by price index of agriculture commodities, manufactured and durables, per capita income and other household characteristics. We can calculate own price elasticity, cross price elasticity and expenditure elasticity demand of the above three equations using the parameter estimates of these three equations. The formulas used to calculate elasticity are:

Own price elasticity of agriculture

$$\varepsilon_{agri,agri} = -1 + \frac{(\gamma_{agri,agri} - \beta_{agri} w_{agri})}{w_{agri}} \qquad (3.13)$$

Own price elasticity of other commodity groups can be calculated in the same matter. Important feature of these formula worth noting is that elasticity depends o the share of each commodity group in a household`s demand system. Hence a commodity group can be inferior, normal or luxury depending on the household under consideration.

Cross price elasticity can also be computed from the estimates using the formula: Cross Price Elasticity of Agriculture

$$\varepsilon_{agri,manu} = \frac{(\gamma_{agri,manu} - \beta_{agri} w_{manu})}{w_{agri}} \qquad (3.14)$$

This value will show the responsiveness of demand of agricultural commodities towards changes in the price index of price index of manufactured goods. The cross price elasticity of other commodity groups can be computed in the same manner.

In similar pattern expenditure elasticity of demand can be computed by the formula

$$\eta_{agri} = \frac{\beta_{agri}}{w_{agri}} + 1 \qquad (3.15)$$

The nature of a commodity group to a consumer (inferior, necessity, or luxury) is to be determined from the value of computed expenditure elasticity.

We can`t estimate all the equations because of complete determination if all commodity groups are to be estimated. Based on the objective of the study the first two equations are

---

[17] *Household characteristics that determine consumption share are not explicitly stated so as to keep the model comprehendible in writing. The whole variables are discussed separately*

estimated[18].

There are important household characteristics that could determine the consumption pattern of farm households. The variables included in this model (under Z_h category) are discussed as follows:

Variables	Description
Age of Household Head (*dagehhhead*[19])	This variable is included in the model to identify if there is an important difference in the consumption behavior of young and aged households. I have taken the age of only of the household head. The variable is measured by the age in years of household heads in June 2010.
Square of Age (*dagehhhead2*)	The effect of age on consumption pattern could be non linear and squared form is included. The variable (*agehhhead*) is squared and included in the model.
Sex of Household Head (*dsexhhhead*)	There may be important differences between male headed and female headed households. A dummy variable of `0` for a male and `1` for a female is included in the model
Educational level of Household Head (*deduchhhead*)	Education and attending schools may give a person an outlet and way out for a person to better interact with an outside environment including market. Educational levels are measured by a dummy variable of illiteracy and literate.
Family Size (*dadultequiv*)	The total number of people in a family converted to an adult equivalence[20]. The larger the family size is the more capable a household could be to have a member unassigned to a task. This could help to better involve with a market.
Estimated distance to all weather road (*ddistroad*)	The walking distance from a house of each household to the nearest all weather road. The distance is measured in minutes of walking estimated by the respondents themselves
Net Purchase of Agricultural	Farm households are both consumers and producers. Households can be either net sellers or net buyers of agricultural produce. I

---

[18] *In general, for n commodity groups we can estimate n-1 equations. Literature (Farooq et al, 1999; Carriker et al, 1993) shows that estimation of parameters of the nth equation can be derived from the other n-1 parameters. The 'sureg' command in STATA provides estimates of the nth equation and I have used those estimates.*

[19] *Text in parenthesis is the variable name*

[20] *I have Used OECD (Organization for Economic Cooperation and Development) scale to calculate adult equivalence which assigns 1, for the first adult; 0.7, for other adults and 0.5, for a child less than 15 years old.*

Commodities (*dnetpurchase*)	have taken total crop selling activities, the amount of money earned from selling. From the sold amount I have deducted the money paid to purchase agricultural commodities. This variable appears as a numeric variable with negative when a household is a net buyer (when monetary value of crops sold is less than crops bought) and positive when net seller.
A Dummy Variable of Total Other Income (*dnonagriincdum*)	Apart from income and/or own production from agriculture some households have non agricultural sources of income including migrant income and remittances. It is measured as a dummy variable with `0` when no migrant and remittance income and `1` otherwise.
dhirlabtotinc	Members of a family can be employed and earn income on farm activities in nearby area. This could reflect a distinct household strategy and may influence consumption pattern of households. I have included the income from hired income
dfemratio	Females and males may have different taste and preference of consumption. Sex of heads of households is included in the model. In addition the size of female members in a household can have an important effect on consumption. Taking the number of females in the model will be problematic due to a possible multicollinearity with family size. Hence I have included the ratio of female members from the total family size
dhousedum	Wealth of households has an important influence on consumption behavior of people. House, which is an important wealth, could indicate the wealth ownership of farm households. Hence I have included a dummy variable about house ownership of households. The variable is included taking 0- if no ownership of a house, and 1- otherwise.
dtlupack	In a rural area of a developing country modern transportation facilities are not usually well established. Farm households use pack animals as an important means of transportation and in turn ownership of these animals will affect consumption behavior. Hence I have included ownership of pack animals as measured by Tropical Livestock Unit.

3.3.2 Model Two

The second model is very similar with the first one except that manufactured goods are further classified into three different groups. Manufactured goods are grouped into manufactured food, manufactured cloth and other manufactured commodities.

The need of further classifying comes from a possible difference in the behavioral response of farm households for different groups. The own price, cross price, and expenditure elasticity of farm households towards food commodities may be different from manufactured clothes and others. These elasticities in the second model are defined and estimated in a similar way as in the first model, except for the change in subscripts.

4. Descriptive Analysis

4.1 Consumption Share Manufactured Commodities Group

All items in the consumption bundle of farm households are grouped into agriculture, manufactured and durables. As the objective of the thesis is to identify the possible domestic demand for manufactured goods the main emphasis is on manufactured goods. However, a demand for agricultural goods or durables will directly and indirectly affect the demand for manufactured goods. Hence knowing how much proportional share of consumption expenditure is spent on manufactured goods is important.

The share of manufactured goods from total consumption expenditure is presented in two different ways; by total household expenditures, and by households' per capita expenditures. The level of expenditure is arranged in to deciles so that we can observe if there is a systematic difference in the consumption share of manufactured goods across different levels of per capita and total household expenditures.

4.1.1 Consumption Share of Manufactured Goods and Household Annual Expenditure

Consumption behaviour of a household is strongly influenced by the level of income at disposal. Decisions about what items and how much of it to purchase, including purchase of manufactured goods, will often be taken by heads of household (and other members as well) who will consider, among other things, total income of the household. Total income is approximated by total consumption expenditure and the analysis in this section shows percentage share of manufactured goods against different levels of total household expenditure.

The following table shows the share of manufactured goods at different levels of annual total household expenditure[21].

---

[21] *Total household Expenditure (total expenditure) is the total consumption expenditure of a household in a year*

Table 4.1: Consumption Proportion of Manufactured Commodities in Different Percentiles of Annual total household Expenditure

| Percentiles of Total Household Expenditure | Total Household Expenditure (birr)[22] (a) | Average Consumption Share of | | | Share of Manufactured Goods (percent) | Average Household Expenditure (birr) |
		Manufactured Goods (percent)	Agriculture Share (percent)	Durables Share (percent)		
10	2145	17.1	82.8	0.04	4.9	4210
20	3016	13.2	85.8	1.1	7.9	7519
30	3893	12.9	84.7	2.3	9.9	6839
40	4589	12.7	86.2	1.1	11.9	7623
50	5513	15.2	83.3	1.4	13.1	7656
60	6572	14.4	85.1	0.5	14.9	7678
70	8117	17.0	79.4	3.6	17.5	8409
80	10569	15.5	81.1	3.2	20.5	6874
90	14197	15.4	83.1	1.4	25.9	5759
Mean	7513	14.7	83.3	1.9		

Table 4.1 shows different levels of total household expenditure and consumption share of manufactured goods. In the first three columns deciles are arranged with total household expenditure, and in the second three columns it is arranged based on share of manufactured goods.

The mean total household expenditure is 7 513 birr and in average manufactured goods represent 14.7% of total consumption expenditure. The figures do not suggest a straightforward relationship between consumption share of manufactured goods and level of total household expenditure.

About 80% of the households have a consumption share of 20.5% and less. With mean share of 83.3% of consumption agricultural products we can see that the consumption of farm households is highly dependent of direct farm products, with no processing and hardly involving the manufacturing sector. This figure seems slightly changing with increased total household expenditure as well. The top 20% of households have manufactured goods consumption percentage share of about 15.5% which is very close to the mean value of 14.7%.

The agriculture share does not show much variation. Almost for all levels of total household expenditure this consumption group makes about 80% of total consumption

---

[22] *Birr is the currency of Ethiopia, and all figures in the descriptive and econometric analyses of this paper are in birr. The exchange rate of birr to dollar at the time of data collection was 1 USD= 13.6047 birr*

expenditure. It is durables, save for the 60% deciles group, which show a relatively more straightforward positive relationship with total household expenditure. Notably, in 4 of 5 deciles in the lowest half of expenditure, the share of durables is below the mean.

A scatter plot even shows negative relationship between the two variables.
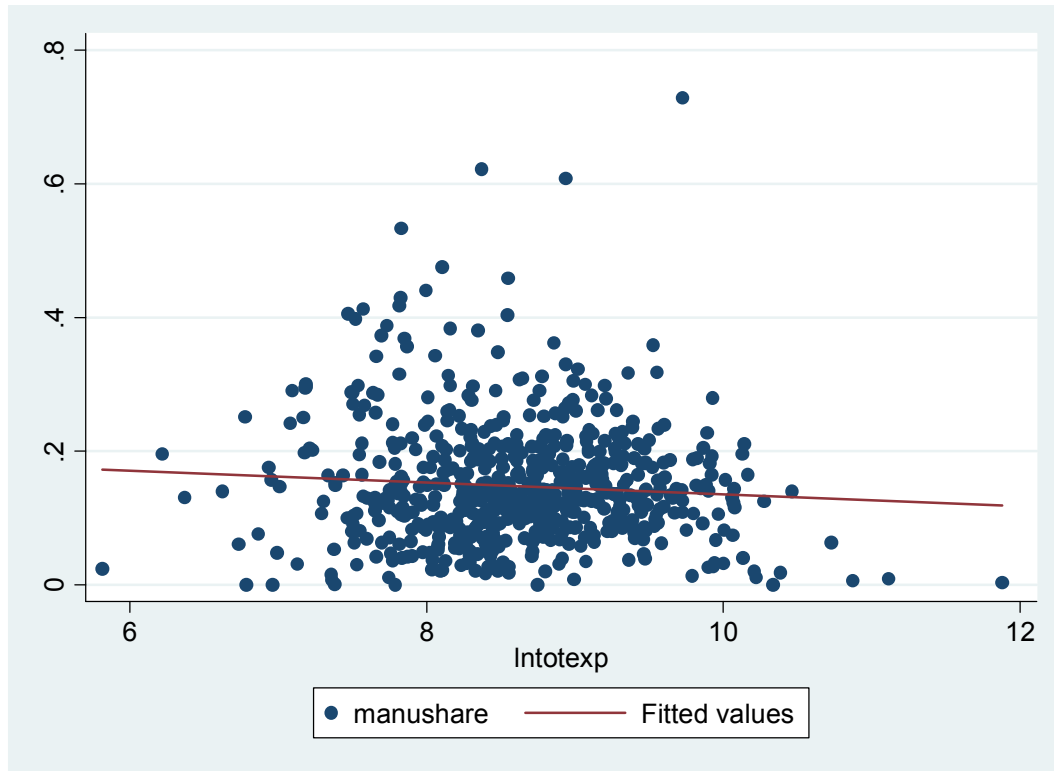
Figure 4.1: A scatter plot on expenditure share of manufactured goods against annual total household expenditure: A line fit

Figure 4.1 shows a negative relationship between share of manufactured goods and total household expenditure. This means that households with higher level of expenditure have lower share of consumption on manufactured. The result does not necessarily mean that they will consume less quantity of manufactured goods in absolute terms. The fact that the line fit has a gentle slope suggests the absolute expenditure might have increased, but the level of increment is relatively lower than the growth of total household expenditure that in turn reduces the expenditure share. This assertion is far from conclusiveness and requires further empirical estimation.

4.1.2 Consumption Share of Manufactured Goods from Per Capita Annual Expenditure

In section 4.1.1 we have seen the relationship between total household consumption expenditure and the percentage share of different consumption groups. The analysis doesn't consider the per capita expenditure level. The family size of different households will naturally have variation and it may be the case that per capita expenditure will

determine the consumption pattern of households in general and the share of manufactured goods in particular. This issue is treated in this section.

Table 4.2: Consumption Proportion of Manufactured Commodities in Different Percentiles of Annual per Capita Expenditure

Percentiles of per capita expenditure	Total household expenditure (birr)[23] (a)	Average Consumption Share of			Share of manufactured goods (percent)	Average total household expenditure (birr)
		Manufactured goods (percent)	*Agriculture share (percent)*	*Durables share (percent)*		
10	683	19.4	80.0	.5	4.9	1301
20	941	14.2	83.2	2.4	7.9	2143
30	1116	15.6	82.9	1.4	9.9	2088
40	1452	14.0	84.5	1.4	11.9	2350
50	1720	16.2	83.2	0.6	13.1	2307
60	2081	15.0	83.7	1.3	14.9	2332
70	2515	14.5	83.3	2.1	17.4	2268
80	3155	14.5	84.7	0.7	20.5	1868
90	4187	13.8	84.6	1.5	25.9	1714
Mean	2278	14.7	83.3	1.9		

Table 4.2 shows average per capita expenditure in each deciles group, as arranged by an ascending order of per capita expenditure. Still, however the two variables do not show a clear trend, positive or negative relationship. The highest share of manufactured goods (19%) is found at the lowest deciles; and the lowest (13.8%) is found at the highest per capita expenditure. These figures seem to suggest a negative relationship between these two variables.   However, the relationship is however not consistent throughout other percentiles, which makes any sort of conclusion ambiguous.

---

[23] *Birr is the currency of Ethiopia, and all figures in the descriptive and econometric analyses of this paper are in birr. The exchange rate of birr to dollar at the time of data collection was 1 USD= 13.6047 birr*

Figure 4.2 shows scatter plot of share of manufactured goods against per capita expenditure.
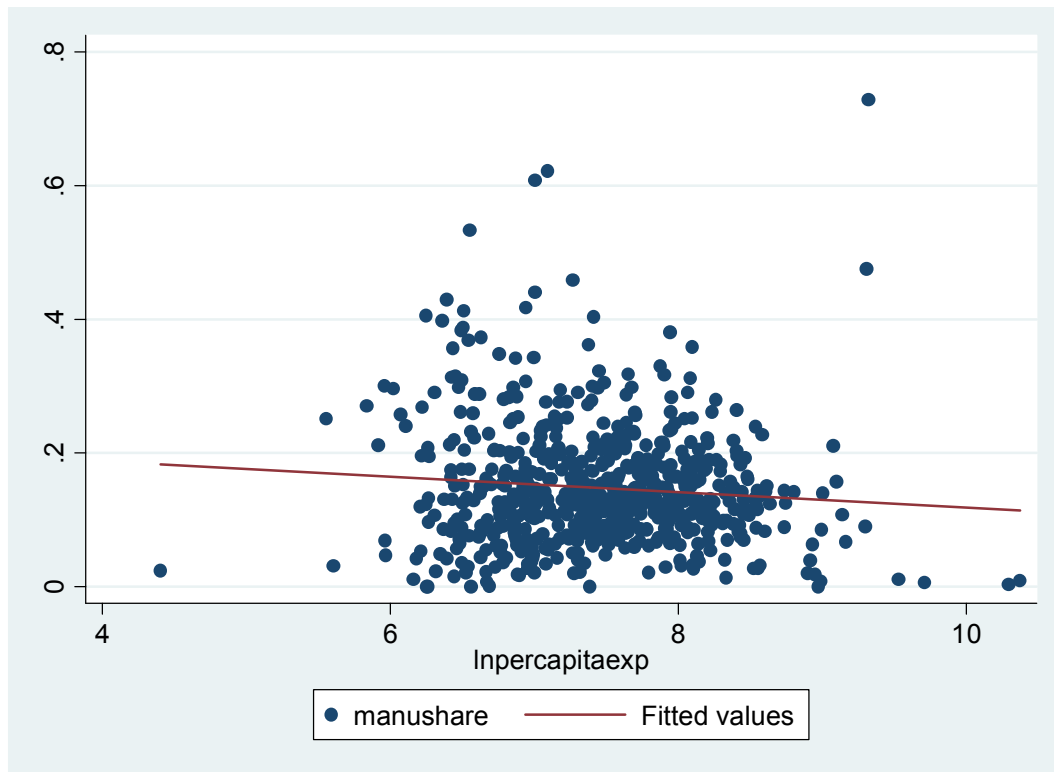
Figure 4.2: A Scatter Plot and Line Fit of Per capita Expenditure against Expenditure Share of Manufactured Goods

The line fit on figure 4.2 shows a negative relationship between share of manufactured goods and per capita expenditure. The slope is steeper than we have seen on figure 4.1 (share of manufactured goods against total household expenditure) which seem to suggest that expenditure on manufactured goods has relatively stronger relationship with per capita expenditure than total household expenditure. However, it is still an empirical question to be estimated and tested further in the econometric model.

4.2 Proportion of Cash Expenditure

Farm households are both producers and consumers of agricultural commodities. Having an own production available for consumption may have an influence to consume more of it. If this situation persists among households the share of manufactured goods may be lower than it would have been had farm households been pure producers or consumers.

Knowing how much of total consumption is from direct outlay of cash could help us know the extent to which these farm households are integrated with a market. The following two subsections deal on this point. The following two sections present a discussion on cash consumption expenditure of male headed and female headed households first, and then

among different commodities.

4.2.1 Cash Expenditure by Sex of Household Head

From a cross section of 508 households in different five zones of Tigray region, 347 are male headed households and 161 are female headed. Annual total household expenditure of male headed households is higher than female headed households. Per capita consumption is, however, higher in female headed. This can be explained by the fact that average family size of female headed households (3.49) is lower than for male headed households (5.64 members total household).

More than half of consumption expenditure is cash expenditure; or accessed from market rather than subsistence consumption. The following table shows proportions of total and per capita consumption in terms of own production expenditure and cash consumption expenditure.

Table 4.3: Cash and Subsistence consumption of Farm Households by Sex of Household Head

Head of household	Total household Cash	Total household Own Production	Total household	Per Capital Cash	Per Capital Own Production	Per Capital
			Expenditure			
Male (birr)	4652	5246	9898	933	1122	2056
percent	46.9	53.1		45.4	54.6	
Female (birr)	3397	3593	6991	1242.11	1457	2699
percent	48.6	51.3		46	53.9	
Total (birr)	4278	4679	8957	1034.24	1217	2251
percent	47.7	52.2		45.9	54.0	

For all households subsistence consumption is higher than cash consumption expenditure. The difference is statistically significant at 1% level of significance (see Annex 3 for the t-test).

Total household expenditure of female headed households is lower than male headed households (the t-test is presented in annex 4). In per capita terms, however, female headed households have a higher level of expenditure. The t- test shows the difference is highly significant (see Annex 5 for the complete t test result).

In both cases females have a higher percentage proportion of cash expenditure. It is not a

usual thing for females to plough a land. This means that unless there is a male member in the household who can undertake a ploughing activity, female headed households have to rent out their land which will decrease[24] their subsistence consumption. A decrease in subsistence consumption will then be compensated by more share of cash consumption that we see from the higher proportion of cash consumption that female headed households have.

4.2.2 Cash and Own Production Expenditure for Different Commodities

The discussion in section 4.2.1 shows subsistence consumption is higher than cash consumption. This fact should not be misleading in considering different commodities for the reason that amount of subsistence consumption is not uniform across commodities. Specifically, subsistence consumption will be higher for agricultural products and lower for manufactured commodities.

Teff, wheat, barley, onion, and coffee represent 49.8% of total expenditure on agricultural commodities. Sugar, oil and cloth represent 55.2% of total expenditure on manufactured goods. I have selected these commodities to observe the consumption expenditure similarities and differences in terms of cash expenditure, if any, among these commodities.

The proportion shows variation, unsurprisingly, among different commodities. The following figure shows annual cash and subsistence consumption total household expenditure of major commodities[25] in the consumption bundle of households.

---

[24] *This does not necessarily mean that land productivity of rented land is low. Rather the amount produced has to be shared between the tenant and the landlord; and the landlord may obtain a lesser amount than was likely to be obtained had the landlord been ploughing his/her land.*

[25] *Major commodities based on total expenditure on these commodities. Teff, wheat, barley and onion represent main produce and own production consumption. Sugar, oil and cloth have to be processed before consumption and will help to evaluate the consumption linkage of rural farm households from manufacturing sector.*

Total household
Expenditure
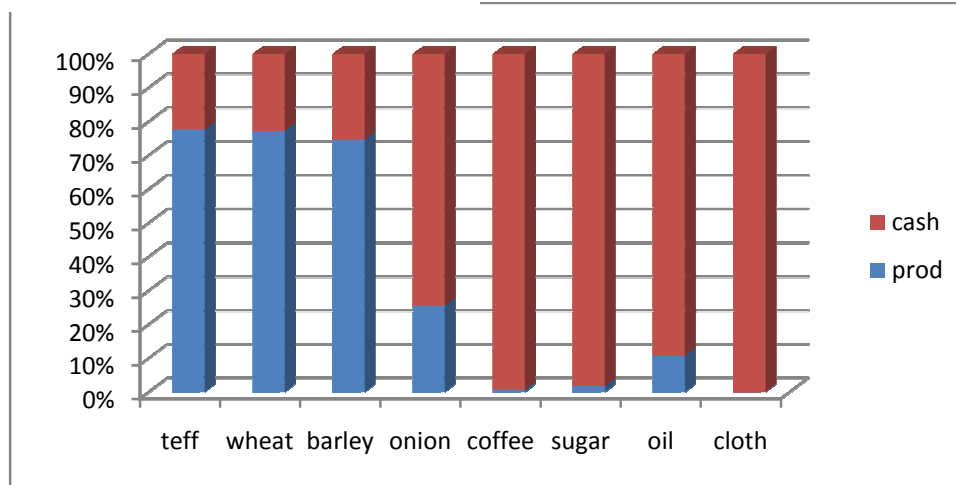
Figure 4.4 Cash and subsistence consumption total household expenditure of different commodities

From total consumption of teff, wheat, and barley, 76.34%, 74.42%, and 73.51% respectively is subsistence consumption. As expected few manufactured goods are produced at home which means consumption of manufactured goods is heavily reliant on cash expenditure.

This assertion has an important bearing on the consumption behaviour of farm households and that is marketing elements (distance, price, transport etc.) will have higher influence on manufactured goods than agricultural commodities. Farm households have to pay transaction cost twice so to consume manufactured goods. First is the cost to be paid while selling their crops, which is a main source of income to finance the expenditure of manufactured goods. Second, they have to procure manufactured goods from a market, which also has transaction costs. Considering the possibility of subsistence consumption, therefore, consumption of agricultural products has less transaction cost.

Hence with imperfect markets, which is the case in developing countries, consumption of manufactured goods or a domestic demand for manufactured goods will be constrained if not dwarfed.

4.3 Types of Markets and Marketing Mix

Markets have an important influence on the demand of a commodity. In developing countries and specifically in rural areas markets are highly imperfect. Higher transaction costs, reflected from distance to the market, required time for inspection and quality control, reliability of measurement units, etc are the factors causing imperfections.

Hence assessing the nature, distance and price of different markets will provide important

information to know about the demand system of farm households.

4.3.1 Transaction Places and Amount of Expenditure

Rural farm households access different products from Neighbours, Markets within Tabia[26], Local Markets, and Distant Markets or by a Visiting trader to an area. The classification of these markets especially Local Markets and Distant markets is not based on precise standards. For a given area the Tabia market could be in 5km distance while for another area the distant market could be found with 5 km radius. A market considered as a distant market in some areas could be a local market (in terms of size of the market, etc). Hence the classification is in relative terms.

Table 4.4 Expenditures and Number of Transactions of Different Commodities in Four Transaction Places or Markets

Commodity	Neighbour Total[27]	Number[28]	Tabia Total	Number	Local Total	Number	Distant Total	Number
Teff	17268	11	1260	3	7465	10	100889	71
	13.6	11.6	1.0	3.2	5.9	10.5	79.5	74.7
Wheat	13110	8	400	1	41672	37	112039	81
	7.8	6.3	0.2	0.8	24.9	29.1	67	63.8
Barley	5190	5			8585	16	56370	49
	7.4	7.1			12.2	22.8	80.4	70
Onion	4868	17	157	6	8414	118	46262.5	293
	8.1	3.9	0.3	1.4	14	27.2	77	67.5
Coffee	8124	12	8416	24	46241	125	168936.2	321
	3.5	2.5	3.6	5.0	20.0	26.0	72.9	66.6
Sugar	3060	13	4094	34	11835	80	50411	217
	4.4	3.8	5.9	9.9	17	23.2	72.6	63
Oil	3984	15	892	10	16278	100	74501	288
	4.2	3.6	0.9	2.4	17	24.2	77.9	69.7
Cloth	1910	7	450	1	18705	66	123525	299
	1.3	1.9	0.3	0.3	12.9	17.7	85.4	80.2

From all commodities in the list, households participate most in transactions related to consumption of coffee. From 508 households in the sample, 482 of them bought coffee. Other commodities that households frequently buy include onion, oil, and cloth.

In all kinds of commodities, at least 63% (sugar) of transactions take place in a distant market. From households that purchase cloth, 80.16 purchases are from a distant market.

---

[26] *Tabia is an administrative unit next to Woreda (Region, Zone, Woreda, Tabia)*
[27] *Total expenditure on transaction with neighbour for all households*
[28] *Total number of households involved in the specific transactions*

Considering all commodities, Tabia markets represent least frequency of visit by the households. The commodity with highest share of transactions made in a Tabia market is sugar, where close to 10% of transactions take place.

In general, most transactions take place in a distant market, followed by local markets and transaction with neighbours. In six of eight commodities, least transaction takes place in a Tabia market. For example, there is no any household that purchase barley from a Tabia market.

The situation is similar in amount of expenditure as well. From total consumption expenditure by all households, at least 67% (wheat) of total expenditure is made in distant markets. For the case of cloth 85.4% of total expenditure by all households is spend in a distant market.

Total Expenditure
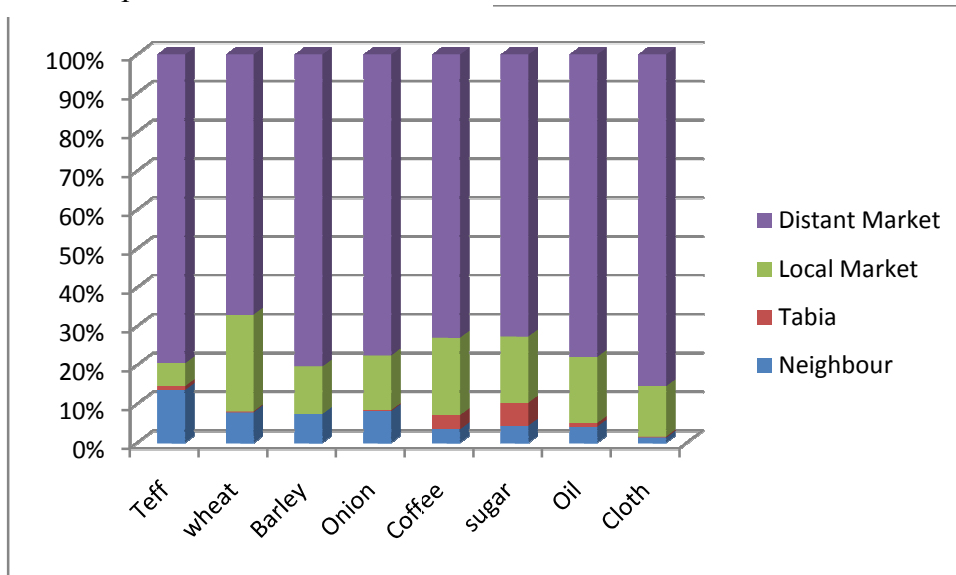
The second market to be visited by most of the households is a local market. From all households, 25.9% of them purchase onion from a local market. From total expenditure on sugar, 17% is spent in a local market. Among the commodities, the least to be purchased from local markets in terms of total expenditure is teff where 5.88% of all expenditure on teff is spent in a local market.

A rational consumer should get some benefit from moving to a distant market when there is a nearby market. Therefore, we have to see the motive behind preferring a distant market. There can be different explanations for this situation including price differences, and availability in quantity and quality of commodities.

4.3.2 Average Price of Commodities in Different Markets

A price margin (if any) can be a motive for farm households to move to a distant market. In this section I have summarized the price at a market where a commodity is purchased and alternative markets.

Table 4.5 Price of Different Commodities in Alternative Markets

Market	Teff	Wheat	Barley	Onion	Coffee	Sugar	Oil/litre
Neighbour (kg)	8.71	5	5.8	5.08	48.8	15.16	26.8/litre
/Mishe[29]						15	
Tabia (kg)	9	8	-	6	42.2	17.41	37.4/litre
Local Market (kg)	8.62	6.32	6.3	5.57	47.4	16.97	22.4/litre
/Mishe	-	-	-	-	-	20	-
/Pack	-	-	-	15	-	-	-
Distant Market (kg)	8.55	5.38	4.9	6.1	46.85	16.32	23.3/litre
/Mishe	13	10	4	8.34	44	26	-
/Shember	-	-	-	6	48	15.5	-
/Minilik[30]	-	-	4	-	-	-	-

There is an interesting observation to be made from this table. For commodities such as teff, wheat, sugar, oil, onion, and coffee the highest price is in Tabia. This partly explains why farm households have lower number of households transacting in Tabia markets. For the case of onion, the highest average price is recorded in distant market (6.1 birr per kg). Still however, largest expenditure for onion is spent in a distant market.

For wheat, barley, onion, and sugar; the prices are lower when purchased from neighbours than local market. The amount of expenditure is higher in local markets than on transaction with neighbours. For the case of coffee, the lowest price is recorded in a Tabia market (42.2 birr per kg). The amount of expenditure is still higher in a distant market and local market.

---

[29] *Mishe is a unit of measurement which is approximately equal to 3 kg.*
[30] *Minilik is a unit of measurement which is approximately equal to 0.6 kg.*
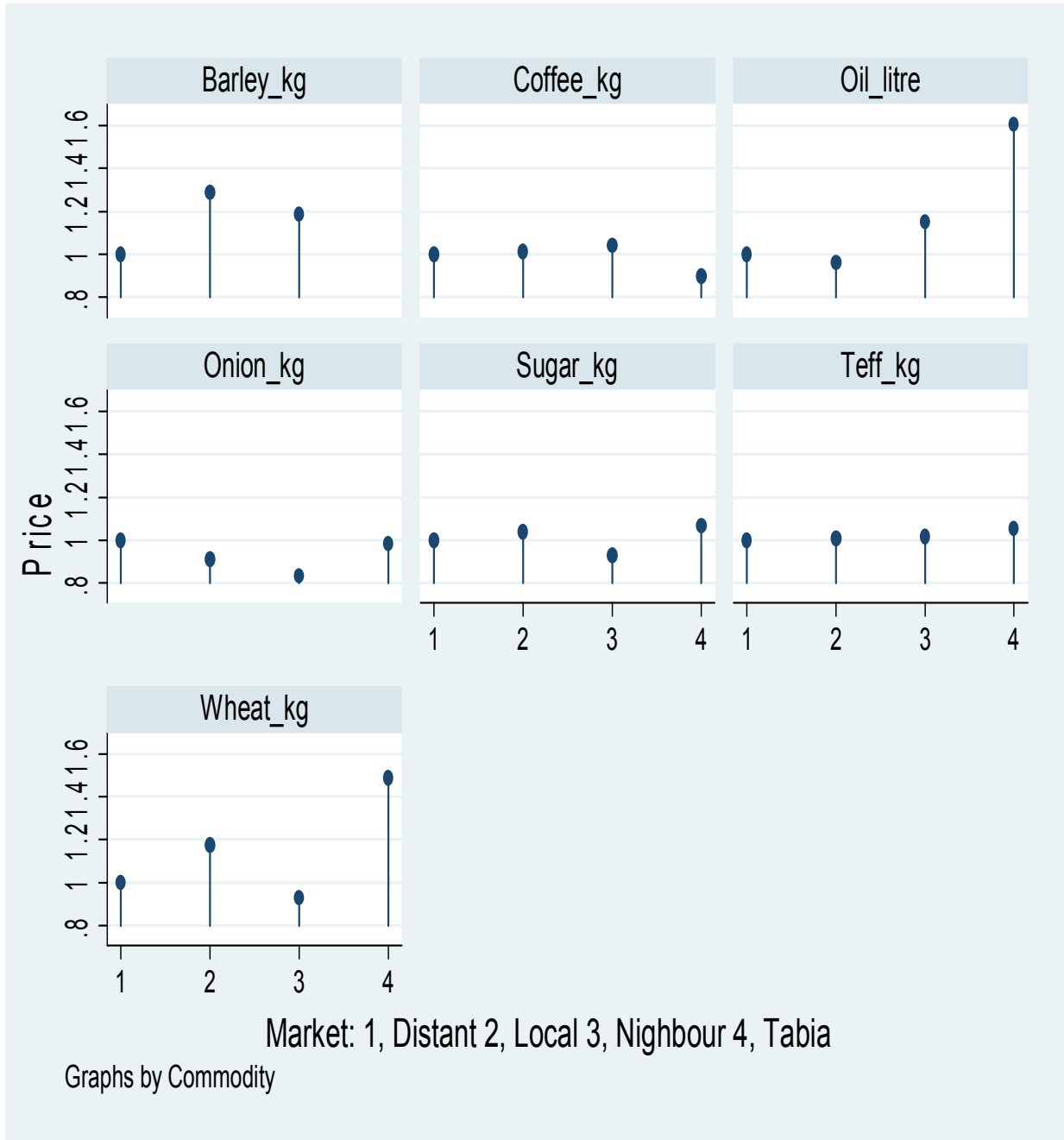
Figure 4.6 Price of Commodities in Different Markets as a percentage of Price in Distant Market

In general, distant markets offer relatively lower prices. From figure 4.6 we can see that in 11 of the cases distant markets have lowest prices and in 4 cases other markets offer lower prices. It is not straightforward to say price is an argument why households prefer distant markets to transaction with neighbours and Tabia markets. There are cases from table 4.6 that transactions are made in distant markets while the price charged by neighbours is lower.

Availability of units of measurement:
Another difference in these markets is units of measurement. Except in case of sugar, the only unit of measurement is `kg` in neighbourhood. We can see from table 4.5 that in distant markets, there are other units of measurement for namely Mishe, Minilik, and Shember for all commodities except oil (which is liquid and the only measure in all markets is litre).

During the survey we came to understand that the conversion unit (how much kg is a minilik, or a mishe) is not standard. A room to inspect the quality of the produce and compare it with other sellers, to check reliability of measures (kg, litre or so) in Tabia markets is more limited than in distant markets, which may explain why households prefer to visit distant markets.

The discussion in this section shows that, in comparison to other markets distant markets attract many households. An observation on the price and market richness (as indicated by availability of units of measurement) partly explains why distant markets are preferred.

The bottom line question is in what way a tendency to visit distant markets will affect consumption of manufactured goods. The effect is both negative and positive. Negative effect is that the higher the distance is the higher will be the transaction cost that limits the incentive to consume manufactured goods. The positive effect is once people are moving to distant markets even to purchase agricultural products; the average cost of transaction will be lower which will be an incentive to consume manufactured goods. The specific answer is however an empirical question which shall be answered in the econometric model.

4.4 Migration and Remittances

Practically all (99.7 %) members in households remain in the village for 12 months of the year. Hence it is not straightforward to see the impact of migration. However, we can evaluate the income as a daily worker and other sources of income. 75% of the households do not have non-agricultural sources of income[31]. For those who participate, the annual income from other sources range from 2,000 to 75,000 birr.

One part of non agricultural sources of income is an income from a migrant. From 508 households, only 10 (2.0 %) report they receive a migrant income. 32 households (6.3%) report as they get a remittance income. From these 32 households, 20 report who earns the income and in 13 of the 20 cases, it is the household head[32] sending remittance.

4.5 Education of Household Heads

---

[31] *This does not include an income from food for work and cash for work programs conducted by government.*
[32] *This does not mean he or she is still the household head*

Most of the household heads (74.6%) are illiterate, while another 8.8% attend religious education. Therefore more than 82% do not have formal education. Less than 1% of the population households have completed 12th grade, the total schooling years to be completed before joining a university. Less than 10 % of the households have attended primary schools and only less than 3% attend more than 7 years of schooling.

Only one percent of the households are net sellers of agricultural commodities, meaning 99% of the households are net buyers. On average, households have consumed 6830 birr more than what they sold which is likely to be covered by non agricultural income sources of income including firewood sales, handicraft sale, sell of beverages, petty trade, owning grain mill, participating in traditional mining, mason.

5. Econometric Analyses

5.1 Share of Manufactured and Agricultural Commodities in Consumption

The list of items in the consumption of farm households is grouped into three: agriculture produce, manufactured goods and durables. The main staples and products in agricultural commodities and produces are teff[33], barley, maize, sorghum and coffee (See *Annex 1* for a full list). Manufactured goods include all that need processing to be ready for consumption; mainly to be purchased in the market. This group includes commodities like Sugar, Oil, and Cloth. It is worthwhile noting that possible that some of the items included in the manufactured goods group could be produced at home, as well, for example cloth.

Based on purpose of the thesis, the researcher did not notice an important difference between the service sector and the manufacturing sector. Hence items like Travel Expenditure, Electricity bill are included in the manufacturing sector as well. Consumption of durables by farm households includes Mobile phones, Radio, Corrugated Iron, Furniture, and Jewellery. The main objective is to assess the linkage of farm households with other sectors. Hence, without loss of generality we can include both the service and manufacturing sector in one group.

Table 5.2 presents simultaneous fixed effect estimation on three classifications of consumable items. There are a total of 327 households with a balanced panel of two years included in the estimation.

A Hausman test (the full test is presented in Annex 8) to choose between random effects or fixed effects model shows that the estimation results are not consistent between the two models. I chose the fixed effects model. We need to know the simultaneous estimation of the three equations: estimation on agriculture share, asset (durable consumption) share and manufacture goods share. STATA does not have a direct command to combine different estimations. I have taken the demeaned value of each variable in 2010 from the two panel year's (2006 and 2010) average and estimate by the 'sureg' command in STATA. In other words, I have estimated fixed effects model manually first, along with the sureg command.

To check the plausibility of manual estimation I have compared the results of fixed effects estimation with the manual and the results are consistent. In the case of simultaneous estimation, however, the standard errors are relatively higher that otherwise would have been underestimated (the complete results are presents through annexes A.9.1 to A.9.3).

The basic difference between the simultaneous result and individual estimates is that the standard error of parameters will be higher in the simultaneous. I have presented the P

---

[33] *An annual grass (Eragrostis tef) common and native to the highlands of Ethiopia that produces a small grain*

value of both estimates in table 5.2.

Separate estimates in three equations show that the models are significant. The computed coefficient of variation (R- squared) shows 'durables share' has the largest value of (49.11%) while it is (14.6%) for the manufacture goods equation. The fixed effects estimation shows as the model is over all significant.

The explanatory and control variables included in the two estimations are presented as follows:

Variables	Description of variables in the descriptive analysis	Form of the variable used in the model[34]
manushare100	percentage share of expenditure on consumption of manufactured goods from total expenditure	Proportional share of manufactured goods (not percent)
agrishare100	percentage share of expenditure on consumption of manufactured goods from total expenditure	Proportional share of agricultural commodities (not percent)
agriindex	Price index of agricultural goods consumed by a household	Natural logarithm of price index of agricultural commodities
mindex	Price index of manufactured goods consumed by a household	Natural logarithm of price index of manufactured goods
durablesindex	Price index of manufactured goods consumed by a household	Natural logarithm of price index of durables purchased by a household
percapita	Per capital consumption expenditure	Natural logarithm of per capita expenditure divided by the general price index[35]
sexhhhead	Sex of head of a household	Sex of head of a household
agehhhead	Age of a household head	Age of a household head
agehhhead2	Squared age of household head	Squared age of household head
educheaddum	A dummy variable on educational level of head of a household	A dummy variable on educational level of head of a household
adultequiva	The family size converted in to an adult equivalence	The family size converted in to an adult equivalence
distroad	The distance to an all weather road measured by the walking minutes required to move from a farm house to the road	The distance to an all weather road measured by the walking minutes required to move from a farm house to the road

---

[34] *All variables in the model are demeaned by the average value of the same variable in a tabia*

[35] *The general price index is calculated by the Stone-Geary Price Index Formula taking all the households in the sample*

netpurchase	Net purchase of agricultural commodities	Net purchase of agricultural commodities
nonagririncdum	A dummy variable about households` non farm income source	A dummy variable about households` non farm income source
hirlabtotinc	Total income from hired out labor	Total income from hired out labor
femratio100	The percentage share of female members in a household	Proportion (not percent) of female members in a family
housedum	A dummy variable about ownership of any kind of house	A dummy variable about ownership of any kind of house
tlupack	Ownership of pack animals converted to Tropical Livestock unit	Ownership of pack animals converted to Tropical Livestock unit

Table 5.1 Descriptive Statistics of Variables included in the Estimation Result Presented in Table 5.2

Variable	Type	Unit of Measurement	Mean	Std. Dev.	Min	Max
Manushare100	Numeric	Percent	14.75	9.03	0	72.89
Durableshare100	Numeric	Percent	1.90	8.10	0	81.48
agrishare	Numeric	Percent	0.83	0.11	0.15	1
lnmanindex	Numeric	Birr	2.59	0.78	0.05	6.82
lnagriindex	Numeric	Birr	1.87	0.73	0.53	12.73
lndurablesindex	Numeric	Birr	0.53	1.58	0	9.95
lnpercapprice	Numeric	Birr	4.99	0.75	2.01	7.84
sexhhhead	Dummy	0- male	0.26	0.44	0	1
agehhhead	Numeric	Years	56.12	13.88	20	100
agehhhead2	Numeric	Years	3342.25	1575.32	400	10000
educhhhead	Dummy	0- illiterate	0.25	0.44	0	1
adultequiva	Numeric	Adult equivalent	3.56	1.45	0.3	8.6
distroad	Numeric	Walking minutes	59.35	59.91	0	420
netpurchase	Numeric	Birr	-5727.86	5646.34	-66038	12562
nonagrincdum	Dummy	0- no other source	0.484	0.50	0	1
hirlabtotinc	Numeric	Birr	229.97	1168.66	0	14400
femratio	Numeric	percent	0.50	0.23	0	1
housedum	Dummy	0- no house	0.73	0.44	0	1
tlupack	Numeric	Tropical Livestock Unit	0.30	0.533	0	5.5

Table 5.2: *Estimation on Consumption Proportion of Manufactured, Durable and Agricultural Commodities (The full Estimation is presented in annex 9)*

Explanatory Variables	Agriculture Share Equation		Manufacture Share Equation		Durable Items Share Equation	
	Coef.	P>z	Coef.	P>z	Coef.	P>z
dlnmanuindex	**-0.020****	0.021	**0.0388****	0.00	**-0.01****	0.049
Dlnagriindex	-0.002	0.813	0.00056	0.93	0.0022	0.649
dlndurablesindex	**-0.035****	0.00	7.78E-05	0.978	**0.0357****	0.00
dlnpercapitaprice	-0.0035	0.776	-0.0147	0.141	**0.0182****	0.018
Dsexhead	-0.03294	0.191	**0.0337***	0.084	0.010678	0.476
Dage	**0.017****	0.00	-0.003	0.235	0.000391	0.841
dage2	**-0.00015****	0.00	3.28E-05	0.14	-1.45E-06	0.932
Deduchead	-0.0064	0.246	**0.0078***	0.067	0.001465	0.653
dadultequiva	-0.0071	0.335	0.008753	0.128	0.00194	0.661
Ddistroad	7.63E-05	0.549	-0.00013	0.198	4.32E-05	0.568
dnetpurchase	**-2.31E-06****	0.016	9.03E-07	0.232	**1.42E-06****	0.014
dnonagrincome	0.010412	0.48	-0.00427	0.708	-0.00951	0.278
Dhilabinc	5.95E-07	0.899	-2.48E-08	0.995	-9.09E-07	0.743
Dfemratio	0.060559	0.11	-0.04512	0.123	-0.01045	0.643
dhousedummy	-0.00064	0.962	-0.01423	0.178	**0.0178****	0.029
Dtlupack	-0.00385	0.746	0.003917	0.67	-0.00038	0.958
_cons	0.001902	0.839	-0.00123	0.866	-0.00808	0.151

* Significant at 10%; ** significant at 5%; *** Significant at 1%

The estimation result shows that price of manufactured goods has a positive and significant effect on consumption share of manufactured goods. The price has a negative effect on the share of other two groups. The reason is that cost share of manufactured goods is sensitive to changes in price, specifically increase the cost incurred in consumption of manufactured goods. However, manufactured goods have inelastic own price demand, which means that the direct positive effect (increased cost because of higher price) outweighs the indirect negative effect (less quantity demand). The increased cost will lower the budget to be allotted to other consumption groups or will decrease the cost share of agriculture products and durable items.

An increased cost share does not necessarily mean that own price elasticity of manufactured goods is positive, and own price elasticity of manufactured goods in this estimation result (the result presented in table 5.2) is negative. Then the justification on how the cost share increased while the quantity of manufactured goods consumed is decreasing is because the percentage decline in quantity is less than the rate at which price has increased that keeps the cost share to be higher.

43

The price of agriculture products has no significant effect on any of cost shares. The price of durable commodities has a negative impact on the cost share of agricultural commodities and a positive impact on cost share of durable items. From this we can understand that an increased cost of durable items is compensated by less of agricultural commodities. This assertion is to be reinforced when we look at the impact of price of durable consumption commodities on cost share of manufactured goods; which is insignificant.

As the per capita expenditure level increases, a larger share of the households' budget will be allotted to consumption of durable items and less to agriculture and manufactured goods. Per capita expenditure has no significant impact on the cost share of the other two groups, agriculture and manufactured goods. Hence, one cannot say at which of consumption groups expense that the increased cost share of durable items is met.

Female headed households consume relatively more manufactured goods; they spend 3.37% more budget share for manufactured goods than male headed households. Age of the household heads also has an impact on the cost share of agricultural commodities. The estimation result shows households with aged heads spend more to agricultural commodities than those with younger heads. The increment in the share of agriculture goods as age increases is at a decreasing rate as the coefficient of age square is negative.

Another variable that significantly affect the cost share of manufactured goods is the educational status of households. Literate households have 0.78% higher cost share in the consumption of manufactured goods. Net crop selling (positive net sell) has a positive effect on the consumption of durables and negative effect on the consumption share of agricultural commodities. One interesting aspect of this result is that households with net crops to sell have low budget share for the consumption of agricultural commodities. Rather they spend more on durables, but no significant effect on the cost share of manufactured goods.

All the above findings suggest that the per capita expenditure level has no significant impact on the consumption pattern of manufactured goods. The idea that it is possible to increase the domestic demand for manufactured goods by increasing the per capita income and then per capita expenditure level of households is not empirically supported at least by the results of this thesis. This assertion is even strengthened by looking at how the crop productions of farm households influence their consumption decision.

Net sellers of agricultural products spend their increased income on durable items rather than manufactured goods. There is no guarantee to say that an increased agricultural production will finally yield more demand for manufactured goods. Accumulation of asset

as indicated by ownership of a house, also bring more demand to accumulate durables. Farm households with ownership of a house have 1.8% higher consumption expenditure for durables.

Other variables such as income from hired labour, ratio of female members from family size, family size as measured by adult equivalence and households' ownership of pack animals did not significantly affect consumption of neither manufactured nor agricultural goods. Most of the households travel to market places on foot, which may be the reason why distance to a road is not significant to affect consumption pattern. A t-test is made on whether distance of households' residence from either a market place or an all weather road affects possession of pack animals. The result shows there is no significant difference in the mean distance of market and road with households' possession of pack animals.

5.2 Cash Expenditure on Agriculture and Manufactured Goods

In section 5.1 we have seen estimates based on both own production and cash consumption expenditures. From the result we have observed that price of agricultural commodities has no significant impact on consumption of agricultural commodities, as well as on other consumption groups. The dominant income source of farm households is agricultural production. The collected data shows that by 2010 agriculture is the *only* source of income for 85.5% of farm households.

The fact that price of agricultural items has no impact on the cost share can be illustrated by the interplay between substitution and income effects. With subsistence consumption, an increase in price of agricultural products will increase income from crop selling (positive income effect) and increase the cost of consumption (negative substitution effect). Insignificance of price of agricultural products of the agriculture share equation may be because of these two effects. A separate estimate using only cash consumption expenditure may provide additional information about the consumer behaviour of farm households.

Variables[36]	Description of variables in the descriptive analysis	Form of the variable used in the model[37]
cashmanushare100	percentage share of expenditure on consumption of manufactured goods from total cash expenditure	Proportional share of manufactured goods (not percent)
cashagrishare100	percentage share of expenditure on consumption of agricultural	Proportional share of agricultural commodities

---

[36] *The two variables which appear as a dependent variable in the two equations are the only differences from the previous model. Hence descriptive statistics of the other variables is not presented twice to keep the document from unnecessary duplicity*

[37] *All variables in the model are demeaned by the average value of the same variable in a tabia*

			commodities from total cash (not percent) expenditure

Table 5.3 Descriptive analysis of variables used in the estimation presented in table 5.4

Variable	Type	Unit of Measurement	Mean	Std. Dev.	Min	Max
cashmanushare100	Numeric	Percent	29.7	16.1	0	92.8
cashagriagrishare100	Numeric	Percent	66.8	18.3	0	99.9
Durableshare100	Numeric	Percent	1.9	8.1	0	81.48

Table 5.3: *Estimation on Consumption Proportion of Manufactured and Agricultural Commodities from Total Cash Expenditure (The full estimation is presented at annex 10)*

dcashagrishare	**Agri Share**		**Manu share**		**Durable Items**	
	Coef.	**P>z**	**Coef.**	**P>z**	**Coef.**	**P>z**
dlnmanuindex	**-0.06***	0.00	**0.083***	0.00	-0.00574	0.241
dlnagriindex	0.0076	0.579	-0.0096	0.426	-2.1E-05	0.996
dlndurablesindex	**-0.046***	0.00	**-0.0089***	0.097	**0.0099***	0.00
dlnpercapitaprice	**0.037***	0.061	**-0.043****	0.021	0.006187	0.367
dsexhead	-0.01772	0.671	0.017596	0.63	0.006099	0.663
dage	**0.017***	0.001	-0.003	0.526	0.001752	0.334
dage2	**-0.00015***	0.002	3.13E-05	0.453	-1.1E-05	0.511
deduchead	-0.01325	0.144	**0.0134***	0.091	0.002355	0.44
dadultequiva	0.005426	0.656	-0.00642	0.551	-0.00065	0.875
ddistroad	2.05E-04	0.329	-0.00028	0.124	2.31E-05	0.744
dnetpurchase	-2.53E-07	0.872	-7.75E-07	0.583	1.32E-07	0.805
dnonagriincdum	8.04E-03	0.742	0.008748	0.682	-0.00028	0.973
dhilabinc	-7.87E-06	0.308	**1.21E-05***	0.073	4.53E-07	0.862
dfemratio	**0.14****	0.025	**-0.108****	0.049	-0.01156	0.583
dhousedummy	-0.00827	0.714	-0.01658	0.402	-0.00014	0.986
dtlupack	0.007473	0.704	-0.0077	0.655	0.003386	0.609
_cons	0.016076	0.296	-0.01539	0.262	0.009083	0.081

* Significant at 10%; ** significant at 5%; *** Significant at 1%

The estimation result in 5.4 which is made only considering cash consumption expenditure looks to be highly consistent with the estimation made considering subsistence consumption as well. There are, nevertheless, some important differences which I discuss in this section.

Price of agricultural items is still insignificant. Price of agricultural goods is insignificant not because of interplay of substitution and income effects. The substitution effect (income effect is ruled out by considering only cash consumption expenditure) is weak or insignificant as well. The rationale behind could be that consumption of these products is of necessity.

Manufactured price is significant in durables equation if both subsistence and cash consumption are considered and insignificant when only cash consumption is considered. The opposite is the case for durables' price in the manufactured goods share equation. Durables price is significant in the manufactured goods equation when only cash expenditure is considered.

Agricultural products, in addition to being food items, are a source of income for farm households. Consumption of durables has to be financed by the income from crop selling; and hence when the cost share of manufactured goods has increases the income allotted for durables from crop selling will decrease, and will indirectly decrease the cost share of durables. This assertion is strengthened by the result that net purchase (more crop selling than buying) has a positive and significant impact only on durables share. That is, partly why, the manufactured goods price is not affecting the cost share of manufactured durables when considering only cash consumption expenditure; at which agricultural products are only consumption items purchased from a market.

When durables' price increases the cost share will also increase, which again decreases the cost share of agriculture and manufactured goods. This result, which is obtained from cash expenditure, will not work for manufactured goods equation when subsistence consumption is also considered. That is because the increased demand (high cost share) for durables will be met by selling agricultural products. We can see that the impact of durables price index, as measured by the coefficient of durables price index agricultural equation, is higher in the cash expenditure (-0.046) than including subsistence consumption as well.

Hired out labour income has a significant and positive impact in the manufactured share equation. Availability of extra income other than from agriculture will relax cash constraint that will enable farm households to consume more of manufactured goods. Per capita expenditure in general, that is without considering the source whether agriculture or other, has negative impact on the cost share of manufactured goods. Additional per capita expenditure has a positive and significant impact on the cash expenditure equation of agricultural products.

This suggests that per capita expenditure has no positive significant impact of increasing manufactured goods. The results indicate that per capita expenditure has insignificant effect. The effect is even negative and significant if only cash consumption is considered

which means there is no way of increasing farm households' demand of manufactured goods by increasing their income from agriculture.

This assertion can be strengthened by looking at different income sources. Income from crop selling has no significant effect on consumption of manufactured goods. Income from hired out labour however has a positive and significant effect on demand for manufactured goods. There can be different reasons as to why income from crop selling is having no impact while income from hired out labour is having a significant impact. The bottom line is there is no guarantee to claim an increased agricultural income could generate increased demand for manufactured goods.

5.3 Own and Cross Price Elasticity of Demand

5.3.1 Own Price Elasticity of Demand

In section 5.1 and 5.2 we have presented the econometric estimation result of an Almost Ideal Demand System and discussed the implications. The parameters in the econometric estimation show the effect of variables on the budget share. Different signs and magnitudes of elasticity (in this section own price and cross price elasticity's) has to be computed later. The magnitude as well as the sign of elasticity will provide additional information that will help to understand the consumption pattern of farm households.

The following table summarizes elasticity of the three consumption groups computed by using the estimation resulted presented on section 5.1.

Table 5.4: *Own and Cross Price Elasticity of Consumption of Manufactured and Agricultural Goods*

Point of percentage share	Agriculture		Manufactured Goods		Durables	
	Cost share	Own Price Elasticity	Cost share	Own Price Elasticity	Cost share	Own Price Elasticity
25%	0.79	-0.999	0.088	-0.544	0	-
50%	0.86	-0.998	0.131	-0.689	0.0001	355.98
75%	0.90	-0.998	0.187	-0.778	0.0003	117.98
100%	0.99	-0.998	0.728	-0.932	0.8148	-0.97
Mean	0.83	-0.998	0.147	-0.721	0.0190	0.86
Remark	Non sig[38].					

The above table shows the own price elasticity of three consumption groups. The value of elasticity differs with the actual share of each consumption groups. The first column indicates the percentage distribution of expenditure share of each consumption group from

---

[38] *The estimation in section 5.1 shows that Agricultural Price Index is insignificant in the agriculture share equation*

total expenditure. From the first two columns, for example, we can understand that agriculture cost share of less than or equal to 79% represent 25% of the observations.

Own price elasticity of manufactured as well as agricultural products is negative. Absolute value of the elasticity falls between 0 and 1, which means that the elasticity of demand for these consumption groups is inelastic.

This value explains why the cost share of these consumption groups from households' total consumption expenditure increases with a rise in price. Inelastic nature of the demand means that the quantity demand falls less proportionately than the price increment. Hence, even though the quantity demand decreases the high price paid for consumed quantity more than compensate the decrement in the total expenditure that comes because less quantity is consumed.

For durables own price elasticity of demand shows unrealistically high variation across different levels of share from total expenditure. This is mainly because farm households have very low consumption of durables (from table 5.1 we can see that the mean consumption share of durables is 1.9) and elasticicty, which compares change from initial value will be high. Specifically, the own price elasticity is higher and positive when the share of durables is low; and negative and low when the share is high. There is one striking similarity, though in the own price elasticity demand across consumption groups, which is that the value of elasticity in absolute values becomes close to one as the share of each of the consumption groups becomes high. At similar levels of share agriculture has high own price elasticity. This is to mean when agriculture has a 79% share from total expenditure the own price elasticity is 0.999; manufactured goods with 72.8% of share has an elasticity of 0.93; and durables with 81.48 % of share have 0.97, which shows that the elasticity of agricultural products is higher.

5.3.2 Cross Price Elasticity of Demand

Different commodities in consumption basket of consumers will naturally have a relationship of economic significance; the form of relationship usually categorized as substitutes, complementary or neutral. It is hence important to identify this element and this section dealt with economic relationship among the three groups of commodities.

Table 5.5 Cross Price Elasticity of Demand

Point of Percentage	Agri. Share	Man. Share	Durables Share	Cross Price Elasticity of		Man. Share	Agri. Share	Durables Share	Cross Price Elasticity of	
				Man. on Agri. Share	Durables on Agri. Share				Agri. on Man. Share	Durables on Man. Share
25%	0.79	0.205	0.000155	-0.024	-0.044	0.088	0.9111	-	0.158	0.088
50%	0.86	0.139	0	-0.022	-0.040	0.131	0.868	0.000513	0.102	0.059
75%	0.9	0.097	0.00028	-0.021	-0.039	0.187	0.8127	0.00E+00	0.067	0.042
100%	0.99	0	0.000032	-0.020	-0.035	0.728	0.27	5.96E-05	0.006	0.011
Mean	0.833	0.165	0.00216	-0.023	-0.042	0.147	0.851	0.00033	0.089	0.053

The cross price elasticity shows that manufactured goods and durables as complementary to consumption of agricultural goods. Consumption of agricultural commodities increases when the price of manufactured goods decreases. This will have an important implication in creating demand for manufactured goods.

We have seen from the own price elasticity of demand that quantity demand of manufactured goods decrease as the price increase. Hence from the own price perspective, a price policy that decrease the price of manufactured goods could be one way of increasing farm households' demand for manufactured goods. On the other hand, demand for agriculture commodities decrease as the price of manufactured goods increase, which will also decrease the demand for complementary goods including manufactured goods.

The last two columns display the cross price elasticity of agricultural products and durables on the demand manufactured goods. The estimation result in section 5.1 shows that the two price indices do not significantly affect the agricultural share equation. Hence interpretation based on these results will be misleading. One point is worth noting, however. In the demand estimation, symmetry is one of the features to be satisfied. In some estimation symmetry restrictions are clearly imposed. I have not included the restrictions as I believe that the nature of the data didn't allow for. The data collection is conducted on a recall basis; farm households are to recall all transactions in the past 12 months. There may be a measurement error associated with the providing the accurate market information, etc. This explains why the symmetry situation is not satisfied.

5.4 Expenditure Elasticity Demand of Manufactured Goods

A growth in the agriculture sector will be reflected by an increased income and consumption expenditure level of the farm households. A positive and high expenditure

elasticity of consumption of manufactured goods will then mean the agricultural sector has a strong consumption linkage and growth in the agricultural sector can be transferred to manufacturing sector.

Table 5.7 summarizes the expenditure elasticity of three consumption groups across different cost share. Level of per capita expenditure is insignificant in the manufactured goods equation when subsistence consumption is also included and in the durables equation when only cash consumption expenditure is considered. Hence I have computed the elasticity of the consumption groups in using parameter estimates of both estimations.

Table 5.6 *Expenditure Elasticity of Consumption of Manufactured and Agricultural Goods in Different Percentiles*

Point of Percentage Share	Subsistence and Cash consumption Expenditure			Cash Consumption Expenditure		
	Expenditure Elasticity of					
	Agri. Products	Manu. G	Durables	Agri. Products	Manu. G	Durables
25%	0.995	0.83	-	1.04	0.51	-
50%	0.995	0.88	183	1.04	0.67	62.87
75%	0.996	0.92	61.67	1.04	0.77	21.62
100%	0.996	0.98	1.02	1.03	0.94	1.00
Mean	0.995	0.9	1.96	1.04	0.71	1.32
Remark	*sig*	*non sig*	*sig*	*sig*	*sig*	*non sig*

Expenditure elasticity in all three equations is positive. This indicates that all the three consumption groups are either normal or necessity, i.e. there are no inferior consumption group.

Demand for agricultural products is sensitive to per capita expenditure, as the parameter is significant in both estimates. The value of elasticity is close to unitary elasticity. At the means share of agricultural products the expenditure elasticity is 0.995 in the estimation made using subsistence and cash consumption expenditure and 1.04 in the estimation considering only cash consumption expenditure.

Expenditure elasticity of durables shows high variation. For some households the proportion of durables consumption expenditure is very low. At those points (for those households) the expenditure elasticity is positive and the magnitude is also very high. At the mean share of durables the magnitude of elasticity is 1.96. This indicates that durables are luxuries items for farm households.

Manufactured goods represent the lowest value of elasticity from all the three consumption

groups. It is in the estimation considering only cash consumption expenditure that per capita expenditure is significant in the manufactured goods equation. In this equation the value of elasticity at the mean expenditure share is 0.71, which is inelastic. Hence we can conclude that demand for manufactured goods is insensitive and inelastic when subsistence consumption is considered, and sensitive but still inelastic when we only consider cash consumption expenditure.

5.5 Estimation of Consumption Share of Different Groups Manufactured Goods

The previous discussions treat all manufactured goods in one group. This approach may ignore some important differences among possible groupings within manufactured goods. In an attempt to deal with this situation manufactured goods are further classified into three: Manufactured Food, Manufactured Cloth and Wear, and Other Manufactured Items. The following table presents a descriptive analysis of variables in the model. All variables except those listed in the following table were used in section 5.1 and 5.2, and hence no new description is made.

Variables	Description of variables in the descriptive analysis	Form of the variable used in the model[39]
manfshare100	Percentage share of expenditure on consumption of manufactured food items from total expenditure	Proportional share of manufactured food items (not percent)
mancshare100	Percentage share of expenditure on consumption of manufactured clothes from total expenditure	Proportional share of manufactured clothes (not percent)
manoshare100	Percentage share of expenditure on manufactured goods other than food and cloth from total expenditure	Proportional share of other manufactured goods (not percent)
manfpindex	Price index of manufactured food items	Natural logarithm of price index of manufactured food items
mancindex	Price index of manufactured clothes consumed by a household	Natural logarithm of price index of manufactured clothes
mansindex	Price index of manufactured clothes consumed by a household	Natural logarithm of price index of other manufactured items

---

[39] *All variables in the model are demeaned by the average value of the same variable in a Tabia*

Table 5.7 *Descriptive Analysis of Variables included in the Econometric Estimate of Table 5.7*

Variable	Type	Measurement Unit	Mean	Std. Dev.	Min	Max
manfshare100	Numeric	Percent	4.70	3.01	0	24.22467
mancshare100	Numeric	Percent	6.50	4.66	0	39.76143
manoshare100	Numeric	Percent	3.90	2.74	0	23.06177
manfpindex	Numeric	Birr	12.98	6.48	4.6	120
mancindex	Numeric	Birr	37.21	33.02	3.5	283.9
manoindex	Numeric	Birr	6.80	38.55	1.1	959.6

The estimation of all of four equations is highly significant (all estimation equations significant at 1%, see Annex 10). The goodness of fit is lower for the equation of three manufactured goods than the agricultural share equation. The goodness of fit is 10.33%, 29.64%, 14.2%, and 33.51% for the equations of manufactured food, manufactured cloth, other manufactured items, and agricultural goods. One of the drawbacks of estimating an almost ideal demand system with commodity share is low level of goodness of fit. Hence the researcher does not think the lower R- squared value is problematic.

Table 5.8 *Estimation of Share of Commodity Groups Including Three Classifications of Manufactured Goods (The full estimation is presented at annex 11)*

Explanatory Variables	Agri. Share		Manu. Food Share		Manu. Cloth Share		Other Manu. Goods Share		Durables Share	
	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
dmanfpindex	**-0.0016***	0.061	**0.0065*** **	0.00	5.89E-05	0.97	**-0.0058*** **	0.00	**-0.00092***	0.092
dmancindex	-0.0002	0.284	**-0.001*** **	0.002	**0.0022*** **	0.00	**-0.0011*** **	0.00	**-0.00052*** **	0.00
dmanoindex	**0.00056*** **	0.00	**-0.00052** **	0.036	-0.00014	0.571	**0.00067*** **	0.003	-6.4E-05	0.446
dlnagriindex	-0.00596	0.436	0.0144	0.319	**0.031** **	0.023	**-0.058**	0.00	0.0018	0.706
dlndurablesindex	**-0.0366*** **	0.00	0.0013	0.84	0.008	0.157	**-0.01***	0.077	**0.035**	0.00
dlnpercapitaprice	0.011	0.283	-0.027	0.233	-0.003	0.881	-0.0045	0.829	**0.024*** **	0.003
dsexhead	**-0.041***	0.079	0.066	0.136	**-0.074***	0.08	0.0178	0.657	0.0069	0.638
dage	0.0005	0.905	-0.007	0.298	0.00093	0.895	0.0064	0.337	-0.00034	0.89
dage2	-1.7E-05	0.612	6.38E-05	0.307	1.85E-05	0.758	-8.1E-05	0.152	4.36E-06	0.834
deduchead	-0.008	0.149	0.008	0.431	0.008	0.429	**-0.017***	0.076	0.00007	0.984
dadultequiva	-0.008	0.233	-0.00086	0.948	0.003	0.809	-0.0032	0.788	0.0013	0.769
ddistroad	6.93E-05	0.556	-3.3E-05	0.88	0.00017	0.422	-5.89E-06	0.977	3.89E-05	0.599
dnetpurchase	**-2.02E-06***	0.02	8.69E-07	0.613	-5.44E-08	0.973	-1.44E-06	0.357	1.57E-06	0.007
dnonagriincdum	0.015	0.277	-0.015	0.558	0.007	0.774	0.01	0.663	-0.008	0.36
dhilabinc	1.22E-06	0.779	-3.28E-06	0.688	-8.75E-06	0.263	7.65E-06	0.301	-6.15E-07	0.821
dfemratio	0.029	0.409	0.113	0.091	0.059	0.35	**-0.16*** **	0.009	-0.014	0.518
dhousedummy	-0.012	0.332	-0.0012	0.961	0.033	0.156	-0.024	0.282	**0.015***	0.062
dtlupack	-0.005	0.609	0.048	0.021	-0.026	0.192	-0.025	0.177	0.00033	0.962
_cons	0.0016	0.848	-0.176	0	-0.133	0	-0.094	0	-0.0028	0.621

* Significant at 10%; ** significant at 5%; *** Significant at 1%

The results are in most cases consistent with the previous estimations made on one group of manufactured goods. Per capita expenditure has no significant effect on any of manufactured goods groupings. It is on the durables equation that per capita expenditure has a positive and significant effect which is the same as the result obtained in section 5.1.

Moreover, as the price of durables increase the expenditure share of agricultural goods decrease but as no effect on the expenditure share of manufactured goods. This indicates as expenditure on durables is to be financed by consuming less of agricultural products, a result we have obtained in section 5.1.

A dummy variable indicating ownership of a house has a positive impact on consumption of durables and no significant effect on other equations. This result is plausible with economic rationality in that people will be encouraged to invest in and/or consume

durables when they are settled at which ownership of house is an indicator.

Price of manufactured clothes and wears has no significant effect on the demand of agricultural commodities; however price of manufactured food items has. This can be because of two reasons. First, which can also be applicable to other consumption groups is the increased cost incurred for food items will decrease the budget allotted for agricultural products. Second, food items, which are manufactured, can be substitutes for agricultural items.

Ownership of a house has a positive and significant effect on the accumulation of durables. House is an important indicator of wealth. This result is consistent with the finding that per capita expenditure which is used to proxy income has no any positive significant effect on consumption of manufactured goods because wealth has to be created through years of savings, which should again come from income. This means that income of farm households' has no significant effect on demand for manufactured goods not only in the short run but also in the long run.

6. Summary and Conclusions

In this paper I have tried to evaluate the domestic demand for manufactured goods that could be generated from growth in the agriculture sector. Along with this analysis, I have investigated what factors influence consumption pattern of farm households and the demand for manufactured goods. To detect possible variations and peculiar features of demand function of farm households, three closely related estimates is made. First, two groups manufactured and agricultural commodities considering consumption of both own production and cash; second, two groups manufactured and agricultural considering only cash consumption; and third four groups in which manufactured goods are further classified in to three sub groups.

Using an Almost Ideal Demand System (AIDS) model I have tried to estimate the demand system (consumption pattern of farm households). Based on the findings I have tried to evaluate plausibility of the assumption taken by Agriculture Development Led Industrialization (ADLI) as guaranteed.

6.1 Own and Cross Price Elasticity

Agricultural pricing policy will not have an immediate impact on the demand system of far households. This is because price of agricultural goods is insignificant in the demand equation of all three consumption groups.

Manufactured goods have negative own price elasticity. The demand for this group is sensitive to price changes but inelastic. Decreasing price will increase the quantity demand. It will however, lower the amount of expenditure on manufactured goods for the reason that quantity will increase less proportionately than the decrement in price.

Durables price has stronger effect on demand for agricultural products than manufactured goods.

6.2 Expenditure Elasticity

Increased per capita expenditure has no significant effect on the demand for manufactured goods. The significant effect is on durables. There can be different motives why people prefer durables as expenditures (income) increase, including a savings motive as some of the durable might be sold in cases of shocks or emergency.

The main result, related to the topic of the theses is, nevertheless it is not straightforward to claim per capita expenditure will generate a domestic demand for manufactured goods. This assertion is even strengthened by looking at how net selling or purchasing affects demand for manufactured goods. The higher is the households' net income from crop

selling the higher will be the demand for durables, while there is significant effect on demand for manufactured goods.

An increased productivity in agriculture- and subsequently higher income and per capita expenditure by farm households will end up generating demand for durables.

From the estimation considering only cash expenditure has a negative impact on demand for manufactured goods; something in unfortunate way goes in contrary to the presumption of ADLI.

Income from hired out labour increases the demand for manufactured goods. Non-agricultural income is more instrumental in creating demand for manufactured goods than income from crop selling or the gross per capita expenditure.

Expenditure elasticity - as computed from parameter estimates considering only cash expenditure - shows demand for manufactured goods is sensitive to changes in per capita level of expenditure.

6.3 Three separate groups

The estimate made on separate groups of manufactured goods shows per capita expenditure is not significant on any of these groups.

6.4 Overall summary

The overall results suggest that there is no guarantee of creating more demand for manufactured goods by increasing agricultural income. Farm households' demand for manufactured goods is insensitive to their per capita expenditure; it s on durables that households spend more as their consumption expenditure increases. Non-agricultural income, however, has a positive effect on demand of manufactured goods. Therefore, in addition to increasing the productivity of agriculture (increasing agricultural income of farm households) the government has to take other measures so as to exploit the increased agricultural income in creating demand for manufactured goods. The estimation however, does not incorporate supply side factors and we cannot suggest what specific steps to be taken.

References:

Adusei, Jumah. Adewale, O. Dipeolu. Idris, A. Ayinde. And Kolawole, Adebayo. (2008). An LA-AIDS Analysis of Cassava Food Products Demand in Lagos, The Journal of Developing Areas- Volume 41, Number 2, pp. 109-117

African Development Bank Group Chief Economist Complex (2010). Ethiopia's Economic growth Performance: Current Situation and Challenges Volume1, Issue

Altinburg, Tilmann (2010). Industrial Policy in Ethiopia, German Development Institute

Banerjee, Abhijit (2000). Notes toward a Theory of Industrialization in the Developing World, MIT

Bezu, Sosina. Barrett, Christopher. and Holden, Stein (2007). Does Non Farm Economy Offer Pathways for Upward Mobility? Evidence from Panel Data Survey in Ethiopia, 2011

Block A. Steven Agriculture and Economic Growth in Ethiopia: Growth Multipliers from a Four Sector Simulation Model, Agricultural Economics, 1999

Braun von Joachim (2007). Rural Urban Linkages for Growth, Employment, and Poverty Reduction, IFPRI, Washington DC USA

Browne M,. GF, Ortmann. and S, Hendriks., Expenditure Elasticities for Rural Houeholds in the Embo Ward, Umbumbulu, KwaZulu-Natal, Agrekon, vol46, No 4, 2007

Carriker, L. Gordon., Featherstone, M Allen. Schroeder, C. Ted. Farm Household Consumption Patterns, Review of Agricultural Economics, Oxford University Press, Vol. 15, No. 1 (Jan., 1993), pp. 63-73

Deichmann. Uwe, Shilpi. Forhad, and Vakis. Renos(2008). "Spatial Specialization and Farm Non Farm Linkages." The World Bank Development Research Group

Dercon, Stefan and Hill, Ruth Vargas; Growth from Agriculture in Ethiopia: Identifying Key Constraints; Paper Prepared as Part of a Study on Agriculture and Growth in Ethiopia, May 2009, Unpublished

Dercon, Zeitlin; Rethinking Agriculture and Growth in Ethiopia: A Coceptual Discussion, Department for International Development, 2009

Diao, X. Fekadu, B., Haggblade, S. Taffesse, A. S., Wamisho K, and Yu, B. Agricultural Policy Linkages in Ethiopia: Estimates Using Fixed and Flexible Price Models. IFPRI

Discussion Paper No. 00695, March 2007.

Ezra markos, and Kiros Gebre-Egziabher (2001). Rural Out Migration in the Drought Prone Areas of Ethiopia: A Multilevel Analysis, Center for Migration Studies of New York International Migration Review

Farooq, et al, An Investigation into Farm Households Consumption Patterns in Punjab, Pakistan, The Pakistan Development Review 38:3 1999 pp. 293-305

Friedman, Milton. A Theory of the Consumption Function, Princeton University Press, 1957

Gebreselassie, Samuel; Intensification of Smallholder Agriculture in Ethiopia: Options and Scenarios: Paper prepared for the Future Agricultures Consortium Meeting at the Institute of Development Studies, March 2006

Geda, Alemayehu; Degefe, BefekaduExplaining African Economic Growth Performance: The Case of Ethiopia, African Economic Research Consortium, 2005

Golan, Amos. Perloff, M. Jeffrey. And Shen, Z. Edward. (2001). Estimating a Demand System with Non Negativity Constraint: Mexican Meat Demand, The Review of Economics and Statistics, Vol. 83, No. 3, pp. 541-550

Gudeta, Zerihun; How Successful the Agricultural Development Led Industrialization Strategy (ADLI) Will Be Leaving the Existing Land Holding System Intact – A Major Constraints for the Realization of ADLI's Targets? JRIF, Vol 1, No 1 (December 2009)

Hazell, B. Peter. Roell , Ailsa. Rural Growth Linkages: Household Expenditure Patterns in Malaysia and Nigeria, IFPRI, 1983

Hirschman A. O. (1958). The Strategy of Economic Development, Yale University Press, New Haven, Connecticut

Jabarin A. S. and Al-Karablieh (2011). Estimating the Fresh Vegetables Demand System in Jordan: A Linear Approximate Almost Ideal demand System, Journal of Agricultural Science and Technology, Volume 5, No. 3, USA

Janvry, de Alain. Fafchamps, Marcel. Sadoulet, Elisabeth. Peasant Household Behavior with Missing Markets: Some Paradxes Explained, the Economic Journal

Mellor, John Dorosch Paul: Agriculture and the Economic Transformation of Ethiopia, IFPRI (2010)

Mellor, J.W. Introduction. In Agriculture on the Road to Industrialization, J. W. Mellor, Ed. Johns Hopkins University Press, Baltimore, 1995, pp. 1-22

Mendola, Mariapia (2006). Rural out Migration and Economic Development at Origin what do we know? Sussex Migration Working Paper

Ministry of Finance and Economic Development; Ethiopia: Sustainable Development and Poverty Reduction Program, Addis Ababa, Ethiopia; 2002

Palley I. Thomas (2008). The Relative Income Theory of Consumption: A Synthetic Keynes- Duesenberry- Friedman Model, Political Economy Research Institute, University of Massachusetts Amherst

Stark, O. and D. E. Bloom (1985). The New Economics of Labor Migration. American Economic Review 75(2): 173-78

Teklu, Tesfaye. S. R. Johnson (1987). Demand Systems from Cross Section Data: An Experiment for Indonesia, Working Paper 87-WP 24

Tolina T. Eyob, Agricultural Development Led Industrialization (ADLI) Strategy Of Ethiopia, 2007, unpublished

Tsegaye Tegenu, Labor Force growth and its Effects on Ethiopian Rural Economy: A Study of Growth Options, Institute for Future Studies, and Stockholm University, 2009

Udry, Christopher (1995). Recent Advances in Empirical Microeconomic Research in Poor Countries, Northwestern University

Verbeek, Marno. A Guide to Modern Econometrics, 2nd edition; Erasmus University Rotterdam, 2004 John Wiley & Sons Ltd

Vogel J. Stephen. Structural Linkages in Agriculture: Production Linkages and Agricultural Demand Led Industrialization, Oxford University Press, 1994

Weisdorf, Jacob L. From domestic manufacture to Industrial Revolution: long-run growth and agricultural development, Oxford Economic Papers 58: 264–287, 2006

Whitaker, James B. and Effland Anne. (2009). Income Stabilization through Government Payments: How is Farm Household Consumption Affected, Agricultural and Resource Economics Review 38/1 (April 2009) 36–48

Woldehanna, Tassew. (2008). Role of urbanization and non agricultural sector for agricultural development: Briefing note prepared for the DFID funded study "Understanding the constraints to continued rapid growth in Ethiopia: the role of agriculture", DFID

Woldehanna, T. Rural Farm Non- Farm Income Linkages in Northern Ethiopia, FAO of the United Nations, Rome, 2002

World Bank Country Study Ethiopia Social Sector Report, The World Bank Washington Dc, 1998

World Bank (2011). World Bank Development Indicators: http://data.worldbank.org/data-catalog/world-development-indicators

Yesuf, M., S. Di Falco, T. Deressa, C. Ringler, and G. Kohlin, The Impact of Climate Change and Adaptation on Food Production in Low-Income Countries: Evidence from the Nile Basin, Ethiopia, IFPRI Discussion Paper No. 828 (Washington, DC: InternationalFood Policy Research Institute, 2008).

The following table shows the list of items in three different consumption groups: agricultural, manufactured and durables.

Agriculture	Manufactured	Durables
Teff	Sugar	Mobile
Wheat	Oil	Radio
Barley	Salt	Corrugated
Maize	Tea	Furniture
Sorghum	Cloth	Jewelery
Millet	Shoe	House Construction
Favabean	Blanket	
Latyrus	Umbrela	
Chickpea	Soap	
Pea	Kerosene	
Linseed	Batteries	
Lentile	Travel	
Gesho	School Fees	
Hanfets	School Book	
Banana	Electricity	
Mango	Cosmetics	
Papaya	House Rent	
Avocado		
Guava		
Orange		
Pepper		
Cabbage		
Onion		
Potato		
Tomato		
Garlic		
Coffee		
Spice		
Beef		
Sheep		
Goat		
Chicken		
Egg		
Milk		
Butter		
Wood		
Chat		

Annex 2

A t- test table between cash and own production consumption

The test compare mean of cash per household expenditure with mean of own production consumption per household.

```
. ttest cashconstotal=ownconstotal

Paired t test
------------------------------------------------------------------------------
Variable |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
cashco~l |     516    4278.306    144.9123    3291.775    3993.614    4562.998
owncon~l |     516    4679.121    149.8553    3404.058    4384.718    4973.524
---------+--------------------------------------------------------------------
    diff |     516   -400.8152    186.9549     4246.8    -768.1033   -33.52704
------------------------------------------------------------------------------
    mean(diff) = mean(cashconstotal - ownconstotal)           t =  -2.1439
 Ho: mean(diff) = 0                              degrees of freedom =     515

 Ha: mean(diff) < 0           Ha: mean(diff) != 0           Ha: mean(diff) > 0
 Pr(T < t) = 0.0163      Pr(|T| > |t|) = 0.0325          Pr(T > t) = 0.9837
```

The result shows that mean of cash consumption expenditure is statistically lower than own production consumption expenditure.

Annex 3

Per capital own and cash consumption for all households

The following table displays a t- test between per capital cash and own production expenditure.
```
. ttest percapitalcash=percapitalown

Paired t test
------------------------------------------------------------------------------
Variable |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
percap~h |     516    1034.241    40.67721    924.0087    954.3273    1114.155
percap~n |     516     1216.82    53.08164    1205.783    1112.537    1321.103
---------+--------------------------------------------------------------------
    diff |     516    -182.579    51.16401    1162.223   -283.0948   -82.06313
------------------------------------------------------------------------------
    mean(diff) = mean(percapitalcash - percapitalown)         t =  -3.5685
 Ho: mean(diff) = 0                              degrees of freedom =     515

 Ha: mean(diff) < 0           Ha: mean(diff) != 0           Ha: mean(diff) > 0
 Pr(T < t) = 0.0002      Pr(|T| > |t|) = 0.0004          Pr(T > t) = 0.9998
```

Per capital own consumption is significantly higher (at 1% level of significance) than per capital cash consumption.

Per Household Expenditure of male and female headed households
This test is about a significant difference in per household expenditure of male and female headed households.

```
. ttest Totalexp, by( sexhhhead)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
    male |     347    9898.681    290.0507    5403.047    9328.197    10469.17
  female |     161    6991.292    321.5009    4079.389     6356.36    7626.225
---------+--------------------------------------------------------------------
combined |     508    8977.245    230.5755    5196.907    8524.244    9430.246
---------+--------------------------------------------------------------------
    diff |             2907.389    478.9186                1966.475    3848.303
------------------------------------------------------------------------------
    diff = mean(male) - mean(female)                            t =    6.0707
Ho: diff = 0                                    degrees of freedom =       506

    Ha: diff < 0                 Ha: diff != 0                  Ha: diff > 0
 Pr(T < t) = 1.0000       Pr(|T| > |t|) = 0.0000         Pr(T > t) = 0.0000
```

The test result shows that per household expenditure of male headed households is significantly (1%) higher than female headed households

This test is about a significant difference in per capita expenditure of male and female headed households.

```
. ttest percapita, by( sexhhhead)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
    male |     346      2733.5    80.76542    1502.324    2574.646    2892.355
  female |     161    3227.284    146.1833    1854.858    2938.587    3515.982
---------+--------------------------------------------------------------------
combined |     507    2890.303    72.70074    1636.978    2747.471    3033.136
---------+--------------------------------------------------------------------
    diff |            -493.7843    154.7719               -797.8604   -189.7081
------------------------------------------------------------------------------
    diff = mean(male) - mean(female)                            t =   -3.1904
Ho: diff = 0                                    degrees of freedom =       505

    Ha: diff < 0                 Ha: diff != 0                  Ha: diff > 0
 Pr(T < t) = 0.0008       Pr(|T| > |t|) = 0.0015         Pr(T > t) = 0.9992
```

Annex 6: Percentage share of Cash Consumption in Male and Female Headed Households

```
. ttest cashtoown, by( sexhhhead)

Two-sample t test with equal variances
-----------------------------------------------------------------------------
   Group |    Obs       Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+-------------------------------------------------------------------
    male |    336   2.890154    .7149194    13.10469    1.483857    4.296451
  female |    158   4.124699    1.069745    13.44648    2.011751    6.237647
---------+-------------------------------------------------------------------
combined |    494   3.285008    .5945208    13.21389    2.116901    4.453115
---------+-------------------------------------------------------------------
    diff |          -1.234545    1.274745               -3.73916    1.270069
-----------------------------------------------------------------------------
    diff = mean(male) - mean(female)                          t =  -0.9685
Ho: diff = 0                                   degrees of freedom =      492

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.1666       Pr(|T| > |t|) = 0.3333       Pr(T > t) = 0.8334
```

Anex 7. A ttest of distance to market and distance to an all weather road by possession of pack animals

```
. ttest distroad, by(packdum)
Two-sample t test with equal variances
-----------------------------------------------------------------------------
   Group |    Obs       Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+-------------------------------------------------------------------
       0 |    325      48.52    2.233368    40.26261    44.12627    52.91373
       1 |    183   45.93443    4.072178     55.0874    37.89968    53.96918
---------+-------------------------------------------------------------------
combined |    508   47.58858    2.046146    46.11779    43.56861    51.60855
---------+-------------------------------------------------------------------
    diff |           2.585574    4.264854               -5.793428    10.96458
-----------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                  t =   0.6063
Ho: diff = 0                                   degrees of freedom =      506

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.7277       Pr(|T| > |t|) = 0.5446       Pr(T > t) = 0.2723

. ttest distmkt, by(packdum)
Two-sample t test with equal variances
-----------------------------------------------------------------------------
   Group |    Obs       Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+-------------------------------------------------------------------
       0 |    298   83.63087    3.131012    54.04965    77.46909    89.79265
       1 |    158   85.06962    4.893406    61.50916    75.40422    94.73502
---------+-------------------------------------------------------------------
combined |    456   84.12939    2.654381    56.68206    78.91302    89.34575
---------+-------------------------------------------------------------------
    diff |          -1.438748    5.583897               -12.41224    9.534743
```

```
--------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                    t =   -0.2577
Ho: diff = 0                                    degrees of freedom =      454

   Ha: diff < 0                    Ha: diff != 0                    Ha: diff > 0
 Pr(T < t) = 0.3984        Pr(|T| > |t|) = 0.7968        Pr(T > t) = 0.6016
```

Annex 8. Hausman Test for Estimation of the Agriculture Share

```
. xtreg agrishare lnmanindex lnagriindex lndurablesindex lnpercapprice sexhhhead
agehhhead agehhhead2 educhhhead adultequiva distroad netpurchase tototherincdum
hirlabtotinc femratio housedum1 tlupack, fe

Fixed-effects (within) regression               Number of obs      =       649
Group variable: hhid                            Number of groups   =       326

R-sq:  within  = 0.3213                         Obs per group: min =         1
       between = 0.2308                                        avg =       2.0
       overall = 0.2698                                        max =         2

                                                F(16,307)          =      9.08
corr(u_i, Xb)  = -0.0679                         Prob > F           =    0.0000


------------------------------------------------------------------------------
   agrishare |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lnmanindex |  -.0260338    .007847    -3.32   0.001    -.0414744   -.0105932
 lnagriindex |  -.0022927   .0075377    -0.30   0.761    -.0171249    .0125395
lndurablesindex | -.0341705   .003475    -9.83   0.000    -.0410084   -.0273326
 lnpercappr~e |  -.0087933   .0118533    -0.74   0.459    -.0321173    .0145307
   sexhhhead |   -.041696   .0239224    -1.74   0.082    -.0887686    .0053767
   agehhhead |   .0001301   .0040122     0.03   0.974    -.0077648    .0080251
  agehhhead2 |  -8.38e-06    .0000343    -0.24   0.807    -.0000758    .0000591
  educhhhead |  -.0343525   .0154103    -2.23   0.027    -.0646758   -.0040293
  adultequiva |  -.0150452   .0071611    -2.10   0.036    -.0291363   -.0009541
     distroad |   .0000625   .0001194     0.52   0.601    -.0001725    .0002974
 netpurchase |  -4.62e-06   1.37e-06    -3.37   0.001    -7.32e-06   -1.92e-06
 tototherin~m |    .006263   .0117198     0.53   0.593    -.0167983    .0293243
 hirlabtotinc |   6.03e-07   4.48e-06     0.13   0.893    -8.21e-06    9.41e-06
    femratio |   .0379105   .0367432     1.03   0.303    -.0343899    .1102109
   housedum1 |  -.0012547   .0126956    -0.10   0.921    -.0262361    .0237267
     tlupack |  -.0011977   .0114582    -0.10   0.917    -.0237444    .0213489
       _cons |   1.011269   .1375338     7.35   0.000     .7406406    1.281897
-------------+----------------------------------------------------------------
     sigma_u |  .07462675
     sigma_e |  .09230645
         rho |  .39526597   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(325, 307) =      1.17            Prob > F = 0.0823

. estimates store fe1
```

```
. xtreg agrishare lnmanindex lnagriindex lndurablesindex lnpercapprice sexhhhead
agehhhead agehhhead2 educhhhead adultequiva distroad netpurchase tototherincdum
hirlabtotinc femratio housedum1 tlupack, re

Random-effects GLS regression                   Number of obs      =        649
Group variable: hhid                            Number of groups   =        326

R-sq:  within  = 0.2985                          Obs per group: min =          1
       between = 0.3244                                         avg =        2.0
       overall = 0.3116                                         max =          2

Random effects u_i ~ Gaussian                    Wald chi2(16)      =     285.05
corr(u_i, X)      = 0 (assumed)                   Prob > chi2        =     0.0000

------------------------------------------------------------------------------
    agrishare |     Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   lnmanindex | -.0393404   .0056858    -6.92   0.000    -.0504843   -.0281965
  lnagriindex |  -.002663   .0056071    -0.47   0.635    -.0136527    .0083267
lndurableindex | -.0310082    .0024989   -12.41   0.000     -.0359059   -.0261105
lnpercappr~e | -.0121968   .0081864    -1.49   0.136    -.0282419    .0038484
    sexhhhead | -.0232519   .0110661    -2.10   0.036     -.044941   -.0015627
    agehhhead | -.0000963   .0019545    -0.05   0.961     -.003927    .0037344
    agehhhead2 |  3.61e-06   .0000172     0.21   0.834    -.0000302    .0000374
    educhhhead | -.0171737   .0092686    -1.85   0.064    -.0353398    .0009924
   adultequiva | -.0119378   .0036222    -3.30   0.001     -.019037   -.0048385
      distroad |  .0000716   .0000663     1.08   0.280    -.0000584    .0002017
   netpurchase | -6.17e-06   1.00e-06    -6.15   0.000    -8.13e-06   -4.20e-06
  tototherin~m | -.0028521    .008623    -0.33   0.741    -.0197528    .0140486
   hirlabtotinc |  4.56e-07   3.28e-06     0.14   0.890    -5.98e-06    6.89e-06
      femratio | -.0088372    .019176    -0.46   0.645    -.0464216    .0287471
     housedum1 |   .004438   .0088073     0.50   0.614     -.012824       .0217
       tlupack |  .0033815   .0076703     0.44   0.659     -.011652     .018415
         _cons |  1.026842   .0683761    15.02   0.000     .8928268    1.160856
-------------+----------------------------------------------------------------
      sigma_u |  .02413124
      sigma_e |  .09230645
          rho |   .0639712   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimates store re1

. hausman fe1 re1

Note: the rank of the differenced variance matrix (14) does not equal the number
of
        coefficients being tested (16); be sure this is what you expect, or
there may be
        problems computing the test.  Examine the output of your estimators for
anything
```

```
                    ---- Coefficients ----
             |        (b)            (B)            (b-B)      sqrt(diag(V_b-V_B))
             |        fe1            re1         Difference           S.E.
-------------+-------------------------------------------------------------------
  lnmanindex |    -.0260338      -.0393404        .0133066           .005408
 lnagriindex |    -.0022927       -.002663        .0003703          .0050377
lndurableindex |   -.0341705      -.0310082       -.0031623          .0024148
lnpercappr~e |    -.0087933      -.0121968        .0034035          .0085722
   sexhhhead |     -.041696      -.0232519       -.0184441           .021209
   agehhhead |      .0001301      -.0000963        .0002264           .003504
  agehhhead2 |    -8.38e-06       3.61e-06        -.000012          .0000296
  educhhhead |    -.0343525      -.0171737       -.0171788          .0123115
  adultequiva |   -.0150452      -.0119378       -.0031074          .0061775
    distroad |      .0000625       .0000716       -9.20e-06          .0000993
 netpurchase |    -4.62e-06      -6.17e-06        1.55e-06          9.36e-07
totootherin~m |     .006263      -.0028521        .0091151          .0079371
 hirlabtotinc |     6.03e-07       4.56e-07        1.47e-07          3.04e-06
    femratio |      .0379105      -.0088372        .0467477          .0313424
   housedum1 |    -.0012547        .004438       -.0056927          .0091439
     tlupack |    -.0011977       .0033815       -.0045793          .0085122
-------------------------------------------------------------------------------
                         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(14) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                     =         24.65
            Prob>chi2 =       0.0382
```

This result indicates that the estimation results are not consistent, and we can't use the random effects model.

In the estimation of the manufactured share equation the estimation results of the random effects and fixed effects model are consistent and we could have used the random effects model. However, once agriculture equation is estimated in fixed effects we have to estimate the manufactured goods equation using fixed effects, as well so that we can produce a simultaneous estimation.

Annex 9. Comparison of Fixed Effects, Demeaned Regression (Manual estimation of fixed effects model), and Simultaneous regression

A.9.1 Fixed effects estimation

```
. xtreg manushare lnmanindex lnagriindex lndurableindex lnpercapprice sexhhhead
agehhhead agehhhead2 educhhhead adultequiva distroad netpurchase tototherincdum
hirlabtotinc femratio housedum1 tlupack, fe

Random-effects GLS regression                  Number of obs     =        649
Group variable: hhid                            Number of groups  =        326

R-sq:  within  = 0.1639                         Obs per group: min =          1
       between = 0.2688                                        avg =        2.0
       overall = 0.2187                                        max =          2

Random effects u_i ~ Gaussian                   Wald chi2(16)     =     171.82
corr(u_i, X)       = 0 (assumed)                Prob > chi2       =     0.0000

------------------------------------------------------------------------------
   manushare |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lnmanindex |   .0475414   .0047246    10.06   0.000     .0382813    .0568014
  lnagriindex |  .0045232   .0046561     0.97   0.331    -.0046026    .0136489
lndurableindex | -.002113   .0020772    -1.02   0.309    -.0061843    .0019584
 lnpercappr~e | -.0109791   .0068079    -1.61   0.107    -.0243224    .0023642
    sexhhhead |  .0277418   .0092787     2.99   0.003     .0095558    .0459278
    agehhhead |  .0001269   .0016371     0.08   0.938    -.0030818    .0033356
   agehhhead2 | -1.89e-06   .0000144    -0.13   0.896    -.0000302    .0000264
   educhhhead |  .0104969   .0077395     1.36   0.175    -.0046723    .0256661
   adultequiva | .0089906    .003028     2.97   0.003     .0030559    .0149253
     distroad | -.0000893   .0000555    -1.61   0.108     -.000198    .0000195
  netpurchase |  3.09e-06   8.33e-07     3.70   0.000     1.45e-06    4.72e-06
  tototherin~m | .0013282   .0071527     0.19   0.853    -.0126907    .0153472
  hirlabtotinc | -4.41e-07  2.73e-06    -0.16   0.871    -5.79e-06    4.90e-06
     femratio | -.0035903   .0160586    -0.22   0.823    -.0350646     .027884
     housedum1 | -.0154214   .0073288    -2.10   0.035    -.0297856   -.0010572
      tlupack | -.0035855   .0063881    -0.56   0.575    -.0161059     .008935
        _cons |  .0648593   .0571938     1.13   0.257    -.0472385    .1769572
-------------+----------------------------------------------------------------
     sigma_u |  .02458954
     sigma_e |  .07633781
         rho |  .09400428   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

A.9.2 Demeaned Regression

```
. reg dmanushare dlnmanuindex dlnagriindex dlndurableindex dlnpercapitaprice
dsexhead dage dage2 deduchead dadultequiva ddistroad dnetpurchase dotherincdum
dhilabinc dfemratio dhousedummy dtlupack

      Source |       SS       df       MS              Number of obs =      327
-------------+------------------------------           F( 16,   310) =     3.31
       Model |  .155300854    16   .009706303          Prob > F      =   0.0000
    Residual |  .908160069   310   .002929549          R-squared     =   0.1460
-------------+------------------------------           Adj R-squared =   0.1020
       Total |  1.06346092   326    .00326215          Root MSE      =   .05413
```

```
       --------------------------------------------------------------------------
        dmanushare |      Coef.    Std. Err.       t     P>|t|     [95% Conf. Interval]
       ------------+-------------------------------------------------------------
       dlnmanuindex |   .0388163    .0070033     5.54    0.000     .0250362    .0525964
       dlnagriindex |   .0006491    .0065915     0.10    0.922    -.0123206    .0136188
    dlndurableindex |   .0000441      .00294     0.02    0.988    -.0057407     .005829
       dlnpercapi~e |  -.0138822    .0102701    -1.35    0.177    -.0340901    .0063257
           dsexhead |   .0336646     .020013     1.68    0.094    -.0057139    .0730431
               dage |  -.0029783    .0025937    -1.15    0.252    -.0080818    .0021251
              dage2 |   .0000327    .0000229     1.43    0.154    -.0000123    .0000777
           deduchead |   .0077814    .0043581     1.79    0.075    -.0007938    .0163565
         dadultequiva |   .0089314    .0059098     1.51    0.132    -.0026971    .0205598
            ddistroad |  -.0001267    .0001011    -1.25    0.211    -.0003257    .0000722
          dnetpurchase |   9.40e-07    7.76e-07     1.21    0.227    -5.87e-07    2.47e-06
         dotherincdum |  -.0042342    .0117135    -0.36    0.718    -.0272822    .0188139
            dhilabinc |  -2.54e-08    3.71e-06    -0.01    0.995    -7.33e-06    7.28e-06
            dfemratio |  -.0450746    .0300776    -1.50    0.135    -.1042566    .0141074
         dhousedummy |  -.0141638    .0108584    -1.30    0.193    -.0355293    .0072017
             dtlupack |    .003912    .0094495     0.41    0.679    -.0146812    .0225051
               _cons |  -.0015204    .0075244    -0.20    0.840    -.0163258    .0132851
       --------------------------------------------------------------------------
```
A.9.3 Seemingly Unrelated (Simultaneous) Regression

```
constraint       1   _b[    dagrishare:dlnpercapitaprice]=   0-   _b   [dmanushare:
dlnpercapitaprice] - _b[ ddurableshare:dlnpercapitaprice]


. sureg (dagrishare dlnmanuindex dlnagriindex dlndurableindex dlnpercapitaprice
dsexhead dage dage2 deduchead dadultequiva ddistroad dnetpurchase dotherincdum
dhilabinc dfemratio dhousedummy  dtlupack) (dmanushare dlnmanuindex dlnagriindex
dlndurableindex dlnpercapitaprice dsexhead dage dage2 deduchead dadultequiva
ddistroad dnetpurchase dotherincdum dhilabinc dfemratio dhousedummy dtlupack)
(ddurableshare   dlnmanuindex   dlnagriindex   dlndurableindex   dlnpercapitaprice
dsexhead dage dage2 deduchead dadultequiva ddistroad dnetpurchase dotherincdum
dhilabinc dfemratio dhousedummy dtlupack), constraint(1)


Seemingly unrelated regression

Constraints:( 1)[dagrishare]dlnpercapitaprice + [dmanushare]dlnpercapitaprice +
[ddurableshare]dlnpercapitaprice = 0
       ---------------------------------------------------------------------
       Equation        Obs   Parms        RMSE      "R-sq"        chi2       P
       ---------------------------------------------------------------------
       dagrishare       327    16       .068153     0.3107      147.27   0.0000
       dmanushare       327    16      .0527001     0.1460       56.16   0.0000
       ddurableshare    327    16      .0404936     0.4911      315.70   0.0000
       ---------------------------------------------------------------------


       ---------------------------------------------------------------------------
                    |      Coef.    Std. Err.       z     P>|z|     [95% Conf. Interval]
       ------------+--------------------------------------------------------------
```

```
 dagrishare      |
  dlnmanuindex   |  -.0202771    .0088129    -2.30   0.021    -.0375501   -.0030042
   dlnagriindex  |  -.0019598    .0082847    -0.24   0.813    -.0181976    .0142779
 dlndurablein~x  |  -.0346823    .0036969    -9.38   0.000     -.041928   -.0274365
   dlnpercapi~e  |  -.0034758    .0122014    -0.28   0.776      -.02739    .0204385
       dsexhead  |  -.0329362     .025194    -1.31   0.191    -.0823155     .016443
           dage  |   .0167982    .0032635     5.15   0.000     .0104018    .0231945
          dage2  |  -.0001461    .0000288    -5.08   0.000    -.0002025   -.0000897
       deduchead |  -.0063601    .0054862    -1.16   0.246    -.0171129    .0043928
     dadultequiva|  -.0071098    .0073808    -0.96   0.335    -.0215759    .0073562
       ddistroad |   .0000763    .0001273     0.60   0.549    -.0001731    .0003257
    dnetpurchase |  -2.31e-06    9.57e-07    -2.41   0.016    -4.18e-06   -4.31e-07
    dotherincdum |   .0104121    .0147451     0.71   0.480    -.0184877     .039312
        dhilabinc|   5.95e-07    4.67e-06     0.13   0.899    -8.57e-06    9.75e-06
        dfemratio|   .0605591    .0378637     1.60   0.110    -.0136523    .1347705
     dhousedummy |  -.0006429    .0136646    -0.05   0.962    -.0274251    .0261392
         dtlupack|  -.0038488    .0118958    -0.32   0.746    -.0271641    .0194665
           _cons |   .0019018    .0093518     0.20   0.839    -.0164275     .020231
----------------+----------------------------------------------------------------
 dmanushare      |
  dlnmanuindex   |   .0388638     .006819     5.70   0.000     .0254988    .0522288
   dlnagriindex  |    .00056     .0064177     0.09   0.930    -.0120185    .0131384
 dlndurableindex |   .0000778    .0028625     0.03   0.978    -.0055326    .0056882
   dlnpercapi~e  |  -.0146956    .0099773    -1.47   0.141    -.0342506    .0048595
       dsexhead  |   .0336821    .0194865     1.73   0.084    -.0045108     .071875
           dage  |  -.0029983    .0025254    -1.19   0.235     -.007948    .0019514
          dage2  |   .0000328    .0000223     1.48   0.140    -.0000108    .0000765
       deduchead |   .0077747    .0042434     1.83   0.067    -.0005423    .0160917
     dadultequiva|   .0087534    .0057525     1.52   0.128    -.0025213    .0200281
       ddistroad |  -.0001266    .0000984    -1.29   0.198    -.0003195    .0000663
    dnetpurchase |   9.03e-07    7.55e-07     1.20   0.232    -5.76e-07    2.38e-06
    dotherincdum |  -.0042659    .0114054    -0.37   0.708      -.02662    .0180882
        dhilabinc|  -2.48e-08    3.61e-06    -0.01   0.995    -7.11e-06    7.06e-06
        dfemratio|  -.0451175    .0292863    -1.54   0.123    -.1025177    .0122826
     dhousedummy |  -.0142338    .0105726    -1.35   0.178    -.0349557    .0064882
         dtlupack|   .0039173    .0092009     0.43   0.670    -.0141161    .0219507
           _cons |  -.0012338    .0073227    -0.17   0.866     -.015586    .0131184
----------------+----------------------------------------------------------------
 ddurableshare   |
  dlnmanuindex   |  -.0103301    .0052398    -1.97   0.049    -.0205999   -.0000602
   dlnagriindex  |   .0022436    .0049316     0.45   0.649    -.0074222    .0119094
 dlndurableindex |    .035755    .0021996    16.25   0.000     .0314437    .0400662
   dlnpercapi~e  |   .0181713    .0076801     2.37   0.018     .0031187     .033224
       dsexhead  |   .0106776    .0149735     0.71   0.476      -.01867    .0400251
           dage  |   .0003905    .0019406     0.20   0.841    -.0034129     .004194
          dage2  |  -1.45e-06    .0000171    -0.08   0.932     -.000035    .0000321
       deduchead |   .0014646    .0032607     0.45   0.653    -.0049263    .0078554
     dadultequiva|   .0019397    .0044214     0.44   0.661     -.006726    .0106054
       ddistroad |   .0000432    .0000756     0.57   0.568    -.0001051    .0001914
    dnetpurchase |   1.42e-06    5.80e-07     2.45   0.014     2.86e-07    2.56e-06
    dotherincdum |  -.0095123    .0087639    -1.09   0.278    -.0266893    .0076647
        dhilabinc|  -9.09e-07    2.78e-06    -0.33   0.743    -6.35e-06    4.53e-06
```

X

```
    dfemratio |  -.0104451    .0225037    -0.46   0.643    -.0545516    .0336614
  dhousedummy |   .0177531    .0081241     2.19   0.029     .0018301    .0336761
     dtlupack |  -.0003755      .00707    -0.05   0.958    -.0142325    .0134814
        _cons |  -.0080837    .0056291    -1.44   0.151    -.0191165     .002949
    ------------------------------------------------------------------------------
```

The values of coefficients are very similar between the fixed effects and the demeaned regression. There are indeed some differences across variables but those variables are insignificant. The simultaneous estimation has an identical value of coefficients with the demeaned regression, however, with relatively inflated standard errors.

Annex 10. Estimation on 'Share of Manufactured Goods' and Agricultural Products Considering only Cash Consumption Expenditure

```
. constraint 2 _b[dcashagrishare:dlnpercapitaprice]= 0- _b[ dcashmanushare:
dlnpercapitaprice] - _b[ dcashdurableshare:dlnpercapitaprice]

. sureg ( dcashagrishare dlnmanuindex dlnagriindex dlndurableindex
dlnpercapitaprice dsexhead dage dage2 deduchead dadultequiva ddistroad
dnetpurchase dotherincdum dhilabinc dfemratio dhousedummy dtlupack) (
dcashmanushare dlnmanuindex dlnagriindex dlndurableindex dlnpercapitaprice
dsexhead dage dage2 deduchead dadultequiva ddistroad dnetpurchase dotherincdum
dhilabinc dfemratio dhousedummy dtlupack) ( dcashdurableshare dlnmanuindex
dlnagriindex dlndurableindex dlnpercapitaprice dsexhead dage dage2 deduchead
dadultequiva ddistroad dnetpurchase dotherincdum dhilabinc dfemratio dhousedummy
dtlupack), constraint(2)

Seemingly unrelated regression

Constraints:
 ( 1)  [dcashagrishare]dlnpercapitaprice + [dcashmanushare]dlnpercapitaprice +
[dcashass
> etshare]dlnpercapitaprice = 0
    ------------------------------------------------------------------------------
    Equation          Obs  Parms        RMSE     "R-sq"        chi2        P
    ------------------------------------------------------------------------------
    dcashagris~e       327    16     .1127104    0.2239       96.91   0.0000
    dcashmanus~e       327    16     .0986679    0.1652       64.19   0.0000
 dcashdurableshare     327    16     .0378475    0.0767       27.97   0.0319
    ------------------------------------------------------------------------------


    ------------------------------------------------------------------------------
              |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
    -------------+----------------------------------------------------------------
    dcashagris~e |
   dlnmanuindex |  -.0602245    .0145703    -4.13   0.000    -.0887818    -.0316671
   dlnagriindex |   .0075983    .0136912     0.55   0.579    -.0192359     .0344326
dlndurableindex |  -.0462323    .0061104    -7.57   0.000    -.0582085    -.0342562
```

```
dlnpercapitaprice |  .0370278   .0197264    1.88   0.061   -.0016352    .0756908
         dsexhead | -.0177239    .041659    -0.43   0.671   -.0993741    .0639263
             dage |  .0171523   .0053953     3.18   0.001    .0065777    .0277269
            dage2 | -.0001461   .0000475    -3.07   0.002   -.0002393   -.0000529
        deduchead | -.0132451   .0090716    -1.46   0.144   -.0310252    .0045349
      dadultequiva |  .0054262   .0121692     0.45   0.656    -.018425    .0292774
         ddistroad |  .0002052   .0002104     0.98   0.329   -.0002072    .0006176
       dnetpurchase | -2.53e-07   1.57e-06    -0.16   0.872   -3.33e-06    2.83e-06
       dotherincdum |   .008041    .024381     0.33   0.742   -.0397448    .0558268
         dhilabinc | -7.87e-06   7.73e-06    -1.02   0.308    -.000023    7.27e-06
          dfemratio |  .1404983   .0626085     2.24   0.025    .0177878    .2632087
       dhousedummy | -.0082669    .022592    -0.37   0.714   -.0525464    .0360125
           dtlupack |  .0074731   .0196701     0.38   0.704   -.0310795    .0460258
              _cons |  .0160755   .0153915     1.04   0.296   -.0140912    .0462422
-------------+----------------------------------------------------------------
   dcashmanus~e |
     dlnmanuindex |  .0826744   .0127681     6.48   0.000    .0576494    .1076994
     dlnagriindex | -.0095639   .0120164    -0.80   0.426   -.0331156    .0139879
  dlndurableindex | -.0089017   .0053598    -1.66   0.097   -.0194066    .0016033
 dlnpercapitaprice |  -.043215   .0186668    -2.32   0.021   -.0798013   -.0066287
          dsexhead |  .0175956   .0364873     0.48   0.630   -.0539182    .0891094
              dage | -.0029996   .0047286    -0.63   0.526   -.0122676    .0062683
             dage2 |  .0000313   .0000417     0.75   0.453   -.0000504     .000113
         deduchead |  .0134396   .0079456     1.69   0.091   -.0021335    .0290126
       dadultequiva | -.0064162   .0107699    -0.60   0.551   -.0275249    .0146925
          ddistroad | -.0002838   .0001843    -1.54   0.124   -.0006451    .0000774
        dnetpurchase | -7.75e-07   1.41e-06    -0.55   0.583   -3.54e-06    1.99e-06
        dotherincdum |  .0087478   .0213558     0.41   0.682   -.0331088    .0506044
          dhilabinc |  .0000121   6.77e-06     1.79   0.073   -1.14e-06    .0000254
           dfemratio | -.1077435   .0548368    -1.96   0.049   -.2152217   -.0002652
        dhousedummy | -.0165812   .0197965    -0.84   0.402   -.0553816    .0222191
            dtlupack | -.0077022   .0172281    -0.45   0.655   -.0414687    .0260642
               _cons | -.0153883   .0137087    -1.12   0.262   -.0422569    .0114803
-------------+----------------------------------------------------------------
  dcashdurasharee |
     dlnmanuindex | -.0057445   .0048989    -1.17   0.241   -.0153462    .0038573
     dlnagriindex | -.0000208   .0046063    -0.00   0.996    -.009049    .0090075
  dlndurableindex |  .0099258   .0020553     4.83   0.000    .0058974    .0139541
 dlnpercapitaprice |  .0061872   .0068572     0.90   0.367   -.0072527     .019627
          dsexhead |   .006099   .0140039     0.44   0.663   -.0213481    .0335462
              dage |  .0017523   .0018142     0.97   0.334   -.0018034     .005308
             dage2 | -.0000105    .000016    -0.66   0.511   -.0000418    .0000208
         deduchead |   .002355   .0030495     0.77   0.440   -.0036219    .0083319
       dadultequiva | -.0006474   .0041085    -0.16   0.875      -.0087    .0074052
          ddistroad |  .0000231   .0000707     0.33   0.744   -.0001155    .0001617
        dnetpurchase |  1.32e-07   5.34e-07     0.25   0.805   -9.15e-07    1.18e-06
        dotherincdum | -.0002819    .008196    -0.03   0.973   -.0163459     .015782
          dhilabinc |  4.53e-07   2.60e-06     0.17   0.862   -4.64e-06    5.54e-06
           dfemratio | -.0115586   .0210463    -0.55   0.583   -.0528087    .0296914
        dhousedummy | -.0001363   .0075959    -0.02   0.986   -.0150239    .0147513
            dtlupack |  .0033856   .0066122     0.51   0.609   -.0095741    .0163452
               _cons |  .0090829   .0052104     1.74   0.081   -.0011293     .019295
```

```
. constraint  3 _b[ dagrishare:dlnpercapitaprice]= 0- _b[ dmanfshare:dlnpercapitaprice]
-_b[ dmancshare: dlnpercapitaprice] -_b[dmanoshare: dlnpercapitaprice]- _b[
ddurableshare: dlnpercapitaprice]

. sureg ( dagrishare dmanfpindex dmancindex dmanoindex dlnagriindex dlndurableindex
dlnpercapitaprice dsexhead dage dage2 deduchead dadultequiva ddistroad dnetpurchase
dotherincdum dhilabinc dfemratio dhousedummy dtlupack) (dmanfshare dmanfpindex dmancindex
dmanoindex dlnagriindex dlndurableindex dlnpercapitaprice dsexhead dage dage2 deduchead
dadultequiva ddistroad dnetpurchase dotherincdum dhilabinc dfemratio dhousedummy
dtlupack) ( dmancshare dmanfpindex dmancindex dmanoindex dlnagriindex dlndurableindex
dlnpercapitaprice dsexhead dage dage2 deduchead dadultequiva ddistroad dnetpurchase
dotherincdum dhilabinc dfemratio dhousedummy dtlupack) ( dmanoshare dmanfpindex
dmancindex dmanoindex dlnagriindex dlndurableindex dlnpercapitaprice dsexhead dage dage2
deduchead dadultequiva ddistroad dnetpurchase dotherincdum dhilabinc dfemratio
dhousedummy dtlupack) ( ddurableshare dmanfpindex dmancindex dmanoindex dlnagriindex
dlndurableindex dlnpercapitaprice dsexhead dage dage2 deduchead dadultequiva ddistroad
dnetpurchase dotherincdum dhilabinc dfemratio dhousedummy dtlupack), constraint(3)

Seemingly unrelated regression

Constraints:
 ( 1)  [dagrishare]dlnpercapitaprice + [dmanfshare]dlnpercapitaprice +
[dmancshare]dlnpercapitaprice + [dmanoshare]dlnpercapitaprice +
[ddurableshare]dlnpercapitaprice = 0
```

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
dagrishare	322	18	.0630792	0.3291	158.58	0.0000
dmanfshare	322	18	.1189717	0.1330	49.33	0.0001
dmancshare	322	18	.1139588	0.1967	78.88	0.0000
dmanoshare	322	18	.1077847	0.1986	79.76	0.0000
ddurableshare	322	18	.0396173	0.5200	348.82	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
dagrishare						
dmanfpindex	-.0016278	.0008672	-1.88	0.061	-.0033275	.0000719
dmancindex	-.0001973	.0001843	-1.07	0.284	-.0005584	.0001639
dmanoindex	-.0005616	.0001319	-4.26	0.000	-.0008202	-.0003031
dlnagriindex	-.0059578	.0076554	-0.78	0.436	-.0209622	.0090466
dlndurableindex	-.0365957	.0034325	-10.66	0.000	-.0433233	-.0298682
dlnpercapi~e	.0113188	.0105361	1.07	0.283	-.0093316	.0319693
dsexhead	-.0412313	.0234701	-1.76	0.079	-.0872319	.0047692
dage	.0004648	.0038937	0.12	0.905	-.0071667	.0080962
dage2	-.0000168	.0000331	-0.51	0.612	-.0000818	.0000481
deduchead	-.0082117	.0056968	-1.44	0.149	-.0193772	.0029537
dadultequiva	-.0081202	.0068064	-1.19	0.233	-.0214605	.00522

```
      ddistroad |    .0000693    .0001178     0.59   0.556    -.0001616    .0003002
   dnetpurchase |   -2.02e-06    8.68e-07    -2.33   0.020    -3.72e-06   -3.22e-07
  dotherincdum |     .014913    .0137189     1.09   0.277    -.0119755    .0418015
      dhilabinc |    1.22e-06    4.33e-06     0.28   0.779    -7.27e-06    9.70e-06
      dfemratio |     .029192    .0353718     0.83   0.409    -.0401354    .0985194
    dhousedummy |   -.0124697    .0128576    -0.97   0.332    -.0376702    .0127308
        dtlupack |   -.0056547    .0110505    -0.51   0.609    -.0273133    .0160039
           _cons |    .0016412    .0085555     0.19   0.848    -.0151273    .0184097
---------------+----------------------------------------------------------------
      dmanfshare |
    dmanfpindex |    .0065264    .0016362     3.99   0.000     .0033195    .0097333
     dmancindex |   -.0010894    .0003484    -3.13   0.002    -.0017721   -.0004066
      dmanoindex |   -.0005233    .0002501    -2.09   0.036    -.0010135   -.0000332
    dlnagriindex |    .0144292    .0144935     1.00   0.319    -.0139775     .042836
 dlndurableindex |    .0013117    .0064916     0.20   0.840    -.0114116     .014035
    dlnpercapi~e |   -.0275309    .0230607    -1.19   0.233    -.0727289    .0176672
         dsexhead |    .0660685    .0442711     1.49   0.136    -.0207013    .1528383
             dage |   -.0076461    .0073445    -1.04   0.298     -.022041    .0067488
            dage2 |    .0000638    .0000625     1.02   0.307    -.0000587    .0001864
        deduchead |    .0084629    .0107482     0.79   0.431    -.0126032     .029529
     dadultequiva |   -.0008568    .0130728    -0.07   0.948    -.0264791    .0247655
        ddistroad |   -.0000334    .0002222    -0.15   0.880    -.0004689     .000402
    dnetpurchase |    8.69e-07    1.72e-06     0.51   0.613    -2.50e-06    4.24e-06
    dotherincdum |    -.015179    .0258814    -0.59   0.558    -.0659056    .0355477
        dhilabinc |   -3.28e-06    8.17e-06    -0.40   0.688    -.0000193    .0000127
        dfemratio |    .1126177    .0667157     1.69   0.091    -.0181427    .2433782
     dhousedummy |    -.001178    .0242603    -0.05   0.961    -.0487273    .0463712
          dtlupack |    .0482878    .0208428     2.32   0.021     .0074367    .0891389
             _cons |   -.1759454    .0165586   -10.63   0.000    -.2083997   -.1434911
---------------+----------------------------------------------------------------
      dmancshare |
    dmanfpindex |    .0000589    .0015672     0.04   0.970    -.0030127    .0031305
     dmancindex |    .0022307    .0003335     6.69   0.000      .001577    .0028844
      dmanoindex |   -.0001357    .0002393    -0.57   0.571    -.0006048    .0003334
    dlnagriindex |    .0314293    .0138732     2.27   0.023     .0042383    .0586204
 dlndurableindex |    .0087861     .006215     1.41   0.157     -.003395    .0209673
    dlnpercapi~e |   -.0032277    .0215639    -0.15   0.881    -.0454923    .0390368
         dsexhead |    -.074115    .0424048    -1.75   0.080    -.1572269     .008997
             dage |    .0009303    .0070349     0.13   0.895    -.0128578    .0147184
            dage2 |    .0000185    .0000599     0.31   0.758    -.0000989    .0001359
        deduchead |    .0081429    .0102947     0.79   0.429    -.0120343    .0283201
     dadultequiva |    .0030198    .0124811     0.24   0.809    -.0214428    .0274824
        ddistroad |    .0001708    .0002128     0.80   0.422    -.0002463    .0005879
    dnetpurchase |   -5.44e-08    1.63e-06    -0.03   0.973    -3.25e-06    3.14e-06
    dotherincdum |    .0071257    .0247897     0.29   0.774    -.0414613    .0557126
        dhilabinc |   -8.75e-06    7.82e-06    -1.12   0.263    -.0000241    6.58e-06
        dfemratio |    .0597363    .0639042     0.93   0.350    -.0655136    .1849862
     dhousedummy |    .0329602    .0232363     1.42   0.156    -.0125821    .0785025
          dtlupack |   -.0260357    .0199644    -1.30   0.192    -.0651652    .0130938
             _cons |   -.1331466    .0157878    -8.43   0.000    -.1640903    -.102203
---------------+----------------------------------------------------------------
      dmanoshare |
    dmanfpindex |   -.0058043    .0014824    -3.92   0.000    -.0087097   -.0028989
     dmancindex |   -.0011324    .0003156    -3.59   0.000     -.001751   -.0005138
      dmanoindex |    .0006732    .0002266     2.97   0.003     .0002291    .0011174
    dlnagriindex |   -.0583849    .0131327    -4.45   0.000    -.0841244   -.0326453
 dlndurableindex |   -.0103981    .0058818    -1.77   0.077    -.0219263    .0011301
```

```
   dlnpercapi~e |  -.0045254    .0210007    -0.22    0.829    -.0456859    .0366352
        dsexhead |   .0178352    .0401085     0.44    0.657    -.0607759    .0964463
            dage |   .0063823    .0066539     0.96    0.337    -.0066591    .0194237
           dage2 |  -.0000811    .0000566    -1.43    0.152    -.0001921    .0000299
        deduchead |  -.0172928   .0097377    -1.78    0.076    -.0363783    .0017927
     dadultequiva |  -.0031941   .0118521    -0.27    0.788    -.0264239    .0200357
        ddistroad |  -5.89e-06    .0002013    -0.03    0.977    -.0004004    .0003886
      dnetpurchase |  -1.44e-06   1.56e-06    -0.92    0.357    -4.49e-06    1.62e-06
     dotherincdum |   .0102112     .023448     0.44    0.663    -.0357461    .0561685
        dhilabinc |   7.65e-06    7.40e-06     1.03    0.301    -6.85e-06    .0000222
        dfemratio |  -.1579253    .0604425    -2.61    0.009    -.2763904   -.0394602
      dhousedummy |  -.0236603    .0219794    -1.08    0.282    -.0667392    .0194186
         dtlupack |  -.0254819    .0188829    -1.35    0.177    -.0624918     .011528
            _cons |  -.0943129    .0150169    -6.28    0.000    -.1237454   -.0648804
-------------+----------------------------------------------------------------
 ddurableshare   |
       dmanfpindex |  -.0009181   .0005449    -1.68    0.092    -.0019861    .0001499
       dmancindex |  -.0005213   .0001161    -4.49    0.000    -.0007488   -.0002938
        dmanoindex |  -.0000635   .0000834    -0.76    0.446     -.000227    .0000999
      dlnagriindex |   .0018219   .0048313     0.38    0.706    -.0076473    .0112911
   dlndurableindex |   .0355083   .0021633    16.41    0.000     .0312683    .0397483
     dlnpercapi~e |   .0239651    .0079451     3.02    0.003     .0083929    .0395373
        dsexhead |   .0069285    .0147428     0.47    0.638    -.0219668    .0358238
            dage |  -.0003374    .0024458    -0.14    0.890    -.0051311    .0044562
           dage2 |   4.36e-06    .0000208     0.21    0.834    -.0000364    .0000452
        deduchead |    .000071    .0035795     0.02    0.984    -.0069447    .0070867
     dadultequiva |   .0012844    .0043745     0.29    0.769    -.0072895    .0098582
        ddistroad |   .0000389     .000074     0.53    0.599    -.0001061    .0001839
      dnetpurchase |   1.57e-06   5.79e-07     2.70    0.007     4.30e-07    2.70e-06
     dotherincdum |  -.0078851    .0086192    -0.91    0.360    -.0247783    .0090082
        dhilabinc |  -6.15e-07    2.72e-06    -0.23    0.821    -5.95e-06    4.72e-06
        dfemratio |  -.0143648    .0222166    -0.65    0.518    -.0579086    .0291789
      dhousedummy |   .0150809    .0080796     1.87    0.062    -.0007548    .0309166
         dtlupack |   .0003312    .0069407     0.05    0.962    -.0132724    .0139348
            _cons |  -.0027461    .0055519    -0.49    0.621    -.0136276    .0081355
-------------------------------------------------------------------------------
```

MASTERS PROGRAM: 2010 NOMA FELLOWS
NORWEGIAN UNIVERSITY OF LIFE SCIENCES
IN COLLABORATION WITH MEKELLE UNIVERSITY

HOUSEHOLD QUESTIONNAIRE

Zone _____

Woreda _____

Tabia _____

Kushet _____

Household ID _____

Name of household head _____

The information collected will be used for research purposes. It will be treated as confidential and will not be used by tax authorities or others to assess the need for food aid or other assistance.

Distance to woreda town (walking minutes)	
Distance to local market (walking minutes)	
Distance to primary school (walking minutes)	
Distance to secondary school (walking minutes)	
Distance to all weather road (walking minutes)	
Distance to transporatation service (walking minutes)	
Distance to health center (walking minutes)	
Distance to grain mill	
Distance to nursery site	
Distance to protected water source(walking minutes)	
Distance to tap water(walking minutes)	

Enumerators:	**Dates interviewed**
First interview:	
Second interview:	
Third interview:	

Data checked by	**When**	**Status**			**Comments**
		ok	**Correct**	**Return**	
Data punched	**When**	**Who**			**Comments**
Pages					
Pages					
Pages					
Pages					

Farm household survey: Household characteristics **Page 1**

Woreda:		Interviewer:		Household number:	
Tabia		Date of interview:			
Kushet		Household head name:			

Household composition in 2002 (E.C.)

Household members | Religion:

MNo:	Name	relationship	Sex	Age	Education	Skills	Occupation	Presence
1		Head						
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								

Codes: Relation to household head: 1=wife, 2=child, 3=grand child, 4=brother, 5=sister, 6=hired labour
7=other, specify:
Sex: 1=female, 2=male. Age: Years. Skills: specify
Education: 0=illeterate, 1=read and write, 2= elementary, 3= church education, 4= secondary, 5=other, specify.
Occupation: 0=dependent, 1= student (in school), 2=watch after animals, 3=housewife, 4= farming
5=hired labourer, 6=off-farm activity, 7=Tabia/kushet officia PA/village official:specify
Presence: Months staying in the household during last 12 months

Do any of the household members live outside the village this year (EC 1995)? | Yes | No |

Name	Place	Purpose	Since when	Coming back when

2

Farm household survey: Household Expenditures   **Page 2**

Expenditure on farm inputs EC 1994-95

Item	Quantity	Own prod.		Purchased	Price	Unit	Tot. Expend.	Where boug	source of cash
Seed, teff									
Seed, wheat									
Seed,maize									
Seed, barley									
Seed, sorghum									
Seed, chickpea									
Seed, Millet									
Seed, Fava bean									
Seed, pea									
Seed, Latyrus									
Seed, others									
Seed, vegetables									
Seed, Pepper									
Other tree seedl.									
Fertilizer: Urea									
Fertilizer: DAP									
Herbicide									
Pesticide									
Tools/equipment									
Manure									
Hired oxen									
Animal salt									
Animal medicine									
Animals bought									
Animal feed:									
Grass									
crop residue (hay stover, etc.)									

Unit: 1) kg; 2) Shember; 3)Minilik; 4) mishe; 5)others. Specify

Where bought: 1: from neighbour, 2: within kushet, 3: local market, 4: woreda market, 5: trader visiting village

Source of cash: 1: ownsavings, 2:formal credit, 3:informal credit,4:sale of own production, 5:sale of assets,6: other specify.

Have you obtained credit to pay for farm inputs or for farm investments? 1) YES, 0) NO. A69 If yes, give details for the 3 last years:

Source	Year	Purpose		Amount	Repayment conditions			
					Frequency	Duration	Interest	completed

Have you over the last 3 years received credit for					Amount	Source	Year
	Nonagricultural investments	Yes	No				
	Consumption loans	Yes	No				
	Family events	Yes	No				
	Other, specify	Yes	No				
		Yes	No				

If you want, are you able to obtain credit for

Purpose	Yes/No	Source		Max amou	Interest rat	Duration	Comment
a. Investment							
in farm inputs							
in oxen purchase							
in other business							
b. Consumption							
c. Family events							

If you have already received credit for some purpose, are you able to obtain more loans before paying back
what you have already obtained? Yes\no

Are you member of a credit association?	Yes=1	No=0	
If yes, do you prefer to get credit on individual basis?		Yes=1	No=0
Has any member in your credit group defaulted?	Yes=1	No=0	
If yes, what were the consequences?			

Does any one in the HH save/put money in	1=Yes	How much?	
any of the following?	0=No	Current	One year ago
DECSI			
Equb			
Edir			
Nearby Bank			
At home			
Others,specify			

3

Farm household survey: Household Consumption Expenditures (last year)

Commodity	Quantity Own Prod	Free food	FFW	Quantity Bought	Where bought	Per	Price Birr	Unit	Own pro Cons.Val	Cash Cons Expenditur	Total Value of Consumption
Teff											
Wheat											
Barley											
Maize											
Sorghum											
Millet											
Faba Bean											
Latyrus											
Chick Pea											
Pea											
Linseed											
Lentile											
other, specify											
Fruites											
Banana											
Mango											
Papaya											
Avocado											
Guava											
Vegetables											
Pepper											
Cabbage											
Onion											
Potato											
Tomato											
Other vegetables											
Garlic											
Coffee											
Spices											

Quantity: Number of units. Per: 1:week, 2:month, 3:season,4: year.
 Unit: 1:Kg, 2:pieces, 3:sheets,4:litre, 5:bags, 6:bundles 7:others, specify etc.
Total expenditure: Includes value of own production. Cash expenditure: On purchased quantity
Own production: Market value (Birr) of own production.
Where bought: 1: from neighbour, 2: within Tabia 3: local market, 4: distant market, 5: trader visiting village

Farm household survey: Household Consumption Expenditures (continued)

Commodity	Quantity Own Prod	Free food	FFW	Quantity Bought	Where bought	Per	Price Birr	Unit	Own prod Cons.Val	Cash Cons Expenditur	Total Value of Consumption
Beef											
Sheep											
Goat											
Chicken											
Eggs											
Milk											
Butter											
Sugar											
Cooking oil											
Salt											
Tea											
Clothing											
Shoes											
Blanket/bedsheet											
Umbrella											
Soap/Wash.p.											
Fuelwood											
Kerosene											
Batteries											
Mobile phone											
Radio											
Corrugated iron											
Furniture											
Travel/Transport											
School fees											
School books etc.											
Health/Medicine											
Income tax											
Land tax											
Religious contribution											
Ceremonies											
Jewelry											
House rent											
House construction											
Cigarettes/Tobacco											
Electricity											
Wood materials											
Leisure (drinks, candies, lotteries etc.)											
Other											

Quantity: Number of units. Per: 1:week, 2:month, 3: season ,4: year.

 Unit: 1:Kg, 2:pieces, 3:sheets,4:litre, 5:bags, 6:bundles 7:others, specify etc.

Total expenditure: Includes value of own production. Cash expenditure: On purchased quantity

Own production: Market value (Birr) of own production.

Where bought: 1: from neighbour, 2: within Tabia 3: local market, 4: distant market, 5: trader visiting village

Farm household survey: Crop Selling Activities

Crop	Kushet				Local market					Woreda market:				
	Quantity	Price/unit	Month sold	Income	Quantity	Price/unit	Where?	Month sold	Income	Quantity	Price/unit	Where?	Month sold	Income
Teff														
Wheat														
Barley														
Maize														
Sorghum														
Millet														
Oats														
Faba Bean														
Latyrus														
Chick pea														
Lentile														
Linseed														
Pea														
Pepper														
Potato														
Tomato														
Banana														
Mango														
Papaya														
Avocado														
Guava														
Pepper														
Cabbage														
Onion														
Carrot														
Tomato														
Garlic														
Coffee														
Eucalyptus														

Means of transport to the different markets: Local market: Distant market:

Frequency of visit to the different markets (Per month)   Local market: Distant market:

Time required to travel one way to/from each market (walking minutes) Local market: Distant market:

Farm household survey: Livestock Production Activities

Animal type	**Stock** 2 years ago	Stock 1 year ago	Stock Current	Born during EC 2001/02	Died during EC 2001/02	Slaughtered EC 2001/02	Bought EC 2001/02	Sold during EC 2001/02	Months in milking (2001/02)	Milk per day (EC2001/02)
Cattle										
Milking cow										
Other cows										
Oxen										
Heifer										
Bulls										
Calves										
Sheep										
Goats										
Horses										
Mules										
Donkeys										
Camel										
Chicken										
Bee hives										

Source of cash to buy the livestock

1	Sale of output		Other
2	Remittance		
3	Credit		
4	Sale of food from FFW		
5	Sale of other livestock		

7

Farm household survey: Livestock Selling Activities EC 2001-02

Animal/ Product	Village				Local Market					Distant market				
	Quantity	Price/unit	When sold	Income	Quantity	Price/unit	Where	When sold	Income	Quantity	Price/unit	Where	When sold	Income
Cattle														
Milking cow														
Other cows														
Oxen														
Heifer														
Bulls														
Calves														
Sheep														
Goats														
Horses														
Mules														
Donkeys														
Chicken														
Butter														
Milk														
Meat														
Eggs														
Skins														
Animal dung														
Honey/Wax														

Reasons for selling livestock last year?

1	To cover food expense
2	To cover clothing and schooling expenses
3	For wedding and other social expenses
4	To cover land tax
5	Others. Specify

Farm household survey: Other Sources of Income 2001 -02 E.C)

Source	Input quantity	Input costs	Who earned	Where/to whom	When/Period	Quantity	Price/ Wage	Income	Years of Experience
Hiring out oxen									
Hire out labour									
Labour exchange									
Assistance received									
Assistance given									
Rent out land									
Employment									
Cash support									
Migrant income									
Remittance Income									
Assistance from relatives									
Government Transfers									
Gifts									
Sale of firewood									
Sale of Handicraft									
Sale of beverages									
Petty trade									
Grain mill									
Other business/services									

Source	Number of months/yr worked	how many person in the hh	Who earned (hh member id)	Input quantity (toal labor mandays)	Outoput Quantity (food in kg or days of work) per year		price/wage (price of wheat per kg or daily payment rate of CFW		Total income	Quantity of food sold
					unit	quantity	unit	price		
Food for Work										
Food Aid										
Cash for Work										
OFSP(Other Food Security Program)										

Employment: permanent job locally, Hire out labour: temporary job locally, Migrant income: temporary job outside community member by household Remittance income: Money sent by relatives permanently living elsewhere

What durable commodities and implements does the household have?

Household Assets	Number now	Year bought Latest	Number bought last year	Price	Current value	Need replacement (# of years)	Implements Owned 1998 EC	Source of cash
Farm inplements								
Plough								
Donkeycart/horsecart								
Plough parts								
Hoe								
Sickle								
Hammer								
Ax								
Spade								
Wheelbarrow								
Other production assets:								
Irrigation equipment								
Irrigation well								
Irrigation pump								
Pond								
Assets								
Furniture								
Radio/cassetplayer								
Wrestwatch								
Bicycle								
Stove								
House with iron roof								
Hut								
Kitchen house								
toilet*								
Jewelry								
Mobile phone								

Source of cash: 1:Sale of output, 2:Remittances, 3:Credit, 4:Sale of food from FFW, 5:Sale of livestock, 6:Savings, 7:Others, specify
*Whether the household has toilet or not should be verified by the interviwer