

HOUSEHOLD-LEVEL CREDIT CONSTRAINTS IN URBAN ETHIOPIA¹

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Abstract

There is a dearth of empirical evidence on the determinants of household credit constraints in Sub-Saharan Africa. Most studies have disproportionately focused either on household credit constraints in rural areas or credit constraints facing firms. There are also a number analytical problems linked with identifying credit constrained households. Using the Fourth Round Ethiopian Urban Household Survey conducted in 2000 which provides a unique set of variables in relation to access to credit, we extended the approach of Jappelli (1990) to identify credit constrained households directly. We find a high percentage of credit-constrained households. After controlling for potential endogeneity and selectivity bias, our econometric models showed that current household resources, number of dependants and location are significant correlates of credit constraints. Further, we discuss the policy implications of our findings.

Keywords: credit constrained households; credit policy; endogeneity; instrumental variables; selectivity bias, urban Ethiopia; Africa

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1. Introduction

A good understanding of the determinants of households' access to credit is an integral part of poverty reduction efforts in poor countries (Amin et al., 2003). The poor are often highly credit constrained because they lack the assets to use as collateral to access loans, which consequently limit their economic opportunities. However, rigorous analysis was hampered by the absence of household-level data that enable researchers to identify credit-constrained households.

There is also yet little information, particularly in urban areas on the characteristics of the households who are likely to be constrained and the extent of credit rationing in the formal sector. This study is motivated by the lack of studies based on survey data collected from urban households in Africa that directly test the presence of credit constraints. Most studies tend to focus on African firms and rural credit markets in Asia especially in India (Akoten et al., 2006; Bigsten et al., 2003; Fafchamps, 2000; Pal, 2002; Kochar, 1997; Bell, et al., 1997). This study which focuses on empirical analysis of households' credit constraints has significant policy implications as the welfare of households can be better examined if those who are credit constrained can be properly identified

For Ethiopia, there is a recent study that examined the role of private transfers and loans on risk management in urban areas (Alvi and Dendir, 2009). However, investigating what determines credit access is more crucial both from empirical and policy perspectives before estimating private transfer or loan receipt equations. Rigorous analysis on credit constraints and other related issues is hampered by the absence of household-level data. There is also little information, particularly in urban areas on the characteristics of the households who are most likely to be credit constrained and the extent of credit rationing in the formal sector.

Our study is motivated by the fact that the provision of credit to households is an important vehicle through which households acquire working capital, adopt technology, build asset stocks and smooth consumption in the face of random volatility of income. Access to loans plays a pivotal role when insurance markets are incomplete, credit markets are imperfect and subsidized credit leads to rationing and other rent-seeking behavior. Credit constraints matter for households'

investment in education, health and nutrition. In an era of expanding urbanization and ever increasing unemployment problem in some of the fastest growth urban centres, access to finance matters a lot. Lack of credit for investment purposes weakens or severely limits the development of small enterprises and other productive self-employment opportunities (Johnson, Malkamaki and Nino-Zarazua, 2009). There is a great deal of exclusion from the formal credit market for many urban residents as most of the credit demand of urban households is largely addressed via informal networks. Hence, understanding credit constraints and their determinants at the micro level is at the heart of household welfare and economic development.

Hence, our study is responses to the acute lack of studies based on urban household surveys from Africa that directly identify the presence and determinants of credit constraints. Our empirical analyses serve to generate some relevant credit policy suggestions. Most studies focus on African firms and rural credit markets in Asia especially in India (Akoten et al., 2006; Bigsten et al., 2003; Fafchamps, 2000; Pal, 2002; Kochar, 1997; Bell, et al., 1997). This study focuses on empirical analysis of credit constraints faced by Ethiopian urban households.

The remainder of the study is organized as follows. Section 2 discusses the literature on the theoretical and empirical issues surrounding credit constraints. Section 3 gives a description of the data and our definition of credit constrained households. Section 4 gives insight into the structure of credit markets in urban Ethiopia. Section 5 presents and discusses our econometric evidence. Finally, we forward concluding remarks and highlight some policy implications of our results.

2. Credit Constraints: Theory and Empirical Evidence

Credit constraints are well documented in the literature (Boucher et al. 2009; Karlan and Zinman, 2010). The main reasons forwarded include asymmetric information, high transaction costs and risk rationing imposed by borrowers unwilling to lose their collateral (Hoff and Stiglitz, 1990; Aryeety and Udry, 1997; Boucher et al., 2005). Households' credit constraints have detrimental effects on asset accumulation and poverty reduction. Credit constraints reduce the capacity to

smooth consumption in the face of idiosyncratic and/or covariate risks and deter investment in children's health and education (Udry, 1991; Zeldes, 1989; Becker and Tomes, 1986; Foster, 1995). Credit constraints would also reduce the availability of financial resources which can be used to buy inputs and finance business start ups. In the specific context of Ethiopia, provision of credit for the poor can complement existing reform packages to pro-poor growth (Kedir, 1999).

The most influential model of the demand for household credit is the permanent or the life-cycle model of consumption (Friedman, 1957). The model assumes the presence of perfect capital markets. An implicit assumption of this neo-classical model is that institutions (economic and political) do not matter even though they determine the structure and costs of human interaction (North, 1994). However, in developing countries, especially low-income countries such as Ethiopia, markets are characterised by institutional rigidities that deny the sustainability of the neo-classical assumptions of well functioning markets, perfect competition and mobility of factors of production. With institutions playing a critical role in determining the performance of economies, it is perhaps not surprising to see personal savings and credit being used to cope income shocks and replace public sector interventions in situations where the state is too weak to implement effective labour market policies.

Households face an environment characterized by underdeveloped capital markets, ubiquitous information asymmetry and weak mechanisms to enforce formal contracts. The main coping mechanism for poor households is informal networks, which act as risk sharing mechanisms (Cox and Fafchamps, 2008). Households are more likely to receive gifts from close relatives such as parents, children and loans from more distant relatives (in-laws, uncles and aunts).

Diagne (1999) investigated the impact of household credit constraints on income, consumption, nutrition and agricultural productivity. Our study focuses on identifying the types of urban households that encountered difficulties in obtaining credit in Ethiopia in addition to examining the significant factors responsible for the constraints and the amount of money borrowed. We believe the results from our analysis would enhance the effectiveness of future credit programmes and other policies (Barham et al., 1996; Carter and Olinto, 2003).

Empirical studies aiming to identify credit constrained households are based on two major approaches. Most of the studies follow an indirect approach based on the sensitivity of current consumption to transitory income (Hall and Mishikin, 1982; Zeldes, 1989; Diagne et al, 2000). It is assumed that, with standard convex preferences, and in the absence of liquidity and borrowing constraints, transitory income shocks should not affect consumption. These indirect tests could result in imprecise estimates of the effects of credit constraints. Also, uncertainty can induce precautionary behavior and a dependence of consumption on transitory income even in the absence of credit constraints. The second approach is a direct one, which exploits information about the status of loan applications of households (Feder et al., 1989; and Jappelli, 1990). The survey by Feder et al. (1989) of China asks households whether at the going interest rate they would have liked to borrow more institutional credit than they were granted. Non-borrowing households were asked about their reason for not borrowing. If it was not due to sufficient credit, but due to inability to obtain credit, then this group was classified as constrained. The authors drop the crucial assumption made in previous studies in the literature, of homogenous credit demand and supply situations for borrowers and non-borrowers. The reason is that often non-borrowers do not borrow, not because they are not credit-worthy or cannot obtain credit, but because they have sufficient liquidity of their own. Furthermore, the liquidity position of unconstrained households as compared to constrained households is found to be much higher. This implies that surplus cash incomes for some households do exist. The reasonable assumption made, therefore, is that households should be analyzed in terms of whether they are credit-constrained or not.

The principles of the direct method were also used by Barham et al. (1996). Households were asked whether they have applied for credit; if so, whether their application was rejected; and if it was approved, whether they have obtained the full amount they requested. Feder et al. (1989) found that defining credit-constrained households this way was compatible with data on the overall liquidity of the households. However, using this method of determining credit constraints also requires collecting information on households that did not apply for credit. We have data on households that did not apply for loans including the reasons for not doing so (see data section for more details).

Jappelli (1990) identifies credit constrained consumers as those who had their request for credit rejected by financial institutions. It can be envisaged that a household will be credit constrained if:

$$C^* - Y - A(1+r) > D \quad (1)$$

where C^* is optimal consumption, Y (income) and A (nonhuman wealth) are the resources available to each consumer, r is the real interest rate and D is the amount that the household can borrow. As can be seen from equation (1), both supply side and demand side factors are at play and will jointly determine whether the household is credit constrained. Households discouraged from taking a loan are categorized as credit constrained. The discouraged are those who answered “yes” to the question: *“Was there any time in the past few years that you (or your husband/wife) thought of applying for credit at a particular place but changed your mind because you thought you might be turned down?”* One may argue that the discouraged are not necessarily constrained if their decision not to apply for a loan is based on interest rate comparisons. In our context, interest rates do not play a discernable role in credit access as most borrowers use informal interest-free sources. Hence, as can be seen in the data section, we also classified discouraged borrowers as constrained. In general terms, and after considering both demand and supply factors, a household will be credit constrained if its demand for credit is higher than the available credit supply. Some of the variables that will determine the extent of the binding constraint are: (i) households’ current resources, (ii) proxies for future income, (iii) demographic characteristics and (iv) proxies for past credit history and institutional constraints.

Based on household surveys conducted in Malawi and Bangladesh, Diagne (1999) and Diagne et al., (2000) argue that the direct approach that classifies households into discrete groups fails to measure the extent of the credit constraints faced by households. This line of research stresses the importance of the data collection methodology that identifies a credit limit variable – the maximum that the lender is willing to lend. This limit is not the maximum the lender is able to lend to any borrower. The borrower is not constrained if the optimal amount desired by her/him is less than the amount that can be borrowed. There are downsides to this

approach. The credit limit variable will not be totally accurate until all potential borrowers apply. In an empirical context, heteroscedasticity would also arise since individuals who are close to their credit limit are more able to accurately predict their limit than those who are further away from their limits.

Zeldes (1989) explicitly used Euler equations, following the pioneering work of Hall (1978), to test the hypothesis that households maximize their lifetime utility subject to credit constraints. He proceeds by specifying a model and split the sampled households into two groups, one of which (with low or negative wealth) is being credit constrained. However, if households are credit-constrained, they may change their consumption without violating the Euler equations, thus weakening the usefulness of such tests (Deaton, 1991).

This paper follows a direct approach to identify credit-constrained households in urban Ethiopia and extend the definition of credit constrained households adopted by Jappelli (1990). We classified households as constrained when they receive a loan amount which is less than they applied for. Other constrained households included the discouraged and whose loan application is rejected. Our extended definition allows us to provide a more comprehensive identification of those constrained. This study attempts to make a modest contribution to the existing scanty literature on urban household credit constraints in an era of rapid urbanization and the need for development finance for small enterprise development and employment generation.

3. Data

Our analysis in this study is based on the 2000 Ethiopian Urban Household Survey (EUHS). A longitudinal analysis would have been more informative. However, previous rounds of the same survey could not be used because they do not contain the relevant variables on household credit constraints. The 2000 survey contains detailed data about the socio-economic characteristics of urban households and their members. It includes modules such as household demographics, education, credit, rural-urban migration, employment and income, consumption, ownership of durables, housing, health, welfare and welfare change indicators. A sample of 1500

households was selected from seven major urban centres of the country. The total sample size was distributed over the selected urban centres proportional to their populations, based on the Ethiopian Central Statistical Authority's (CSA) 1992 projections. Accordingly, the sample included 900 households in Addis Ababa (the capital city), 125 in Dire Dawa, 75 in Awassa, and 100 in each of the other four urban centres (i.e. Bahir Dar, Dessie, Jimma and Mekelle).

Due to the unique nature of our survey information, we identified three categories of credit constrained households. The first category of constrained households constitutes households that report a positive response to the following question: *"During the last 12 months, did any member of your household apply for a loan and was the loan completely rejected?"* The second category of households consists of households that reported receiving a loan amount less than they requested. We strongly think these households are credit-constrained because they settled for less not by their choice but because the lender refused to give them the full amount they wanted. The third category of our constrained households consists of discouraged borrowers. Our data asks the households to supply their reasons why they failed to apply for a loan in the last 12 months. For instance, households have cited many reasons such as *'we will not have any chance of success'*, and *'loan application takes long time to process'*. In the present application, we considered those households that give the above reasons as credit-constrained. Our extended direct approach provides a more complete identification of credit constrained households than previous studies (Diagne et al., 2000; Jappelli, 1990). In the next section, we discuss some of the contextual characteristics of credit markets in urban Ethiopia which will be useful in interpreting the subsequent econometric results.

4. Credit Markets in Urban Ethiopia

This section explores the structure of credit markets in urban Ethiopia in detail based on our survey data. One of the main observable features of credit markets in developing countries is the presence of segmented formal and informal financial institutions (Aryeetey and Udry, 1997; Bell, 1993). The formal sector consists of commercial banks while the informal sector includes microfinance institutions, indigenous credit sources such as landlords, rotating savings and credit associations (ROSCAs), money lenders, trade creditors and family and friends. MFIs can be

hybrids of formal and informal institutions (Akoten et al. 2006). The degree to which these sectors are affected by adverse selection, moral hazard and enforcement problem determines the nature of the transactions between lenders and potential borrowers.

Sources of loans

The information on sources of loans reveals the significance of the informal sector. Similar results are reported elsewhere (Banerjee and Duflo, 2007). According to Table 1, 79% of the 315 households obtained their loan from the informal and semi-formal sectors as opposed to the 21% of loans secured from the formal sector. The most predominant source within the informal sector is '*friends and relatives*' (75%). Not a great proportion of loans originate from group schemes such as ROSCAs. This is not surprising because Ethiopian ROSCAs are primarily vehicles of saving mobilization rather than credit institutions (Kedir and Ibrahim, 2011). It is interesting to note that there are few loans obtained from moneylenders who are dominant lenders elsewhere such as in India and Thailand (Bell, 1993). In the formal sector, the microfinance institutions play a major role in lending (45%) while banks and the government provide very few loans.

Table 1: Source of Loans

Informal and Semi-formal	Number of households (%)
Friends/relatives	186 (59.0)
Credit Association	40 (12.7)
Money Lender	10 (3.2)
Employer	9 (2.9)
Other informal (e.g. ROSCAs)	5 (1.6)
Formal	
Micro-finance institutions	29 (9.2)
Banks	10 (3.2)
Government/NGOs	5 (1.6)
Other formal	21 (6.7)
Total	315 (100)

Source: Authors' calculation from EUHS, 2000

Duration of loans

Almost half of the households that reported taking out loans did not report the due date of their loans. For those we observe valid responses, most of the loans are short-term loans. For instance, 96% of the loans have to be repaid within one year. A further examination of the data reveals that most of the short-term loans have originated from an informal lender. Therefore, there is a strong link between the source and duration of the loan – a link that might extend to the purpose for which the loan amount is used.

Gender and access to credit

We investigated whether households headed by males and females have differential access to various sources of loans. According to Table 2 , on aggregate, both types of households have almost equal access to credit. Interestingly, the number of male headed households that accessed loans is slightly less than that of female-headed households. 55 % of the households that accessed formal loans are headed by females as opposed to 51% in the case of informal loans. While friends and relatives give more loans to males, micro-finance institutions give more loans to females. The high participation by women in informal networks is consistent with other studies in Africa (Hogset, 2005).

Table 2: Distribution of the number of males and females head of households by source of loan

Source of loan	Male	Female	Total
Money lender	3	3	6
Friends/relative	40	37	77
Credit/association	9	14	23
Employer	2	2	4
Other informal	2	2	4
Banks	1	2	3
Government/NGOs	2	2	4
Micro-finance institutions	4	9	13
Other formal	6	3	9
Total	69 (48.25%)	74 (51.75%)	143

Source: Authors' calculation from EUHS, 2000

Lending and borrowing behavior

There are very few households that have a bank account (only 16% of them), indicating little use of formal financial institutions even in an urban setting in Africa. This is interesting, given the fact that our data is from seven major urban areas in Ethiopia including the capital city which constitutes 60% of the total sampled households for the survey. This highlights the acute lack of financial depth.

Uses of loans

Households took loans both for consumption and productive purposes. Consumption credit plays the role of insurance by allowing risk pooling among risk-averse households across time. The two major reasons for taking out a loan related to food purchases (28.5%) and expansion/ setting up businesses (27.6%). Other important reasons include payment of utilities and related expenses (13.8%), financing health, education and transport expenses (13.4%) and purchase of consumer durables (11.0%). Given the small amount of loan transactions, very few households took out a loan to build a house (5.7%). Unlike the findings in rural credit markets, consumption finance is the main reason for borrowing in urban Ethiopia (Alvi and Dendir, 2009; Gill and Singh, 1997). In an attempt to uncover whether there is any systematic relationship between purpose and source of loans, we found that friends and relatives provide loans practically for all purposes. This shows that informal lenders are indifferent to the nature of the project of the borrower. This is due to the fact that they face a low probability of default given their knowledge of their clients. They do not suffer from severe adverse selection, moral hazard and enforcement problems as formal credit institutions. After friends and relatives, credit associations and microfinance institutions are the next largest lenders, and also tend to lend for various purposes. It is well documented that these institutions have stronger enforcement capabilities than formal institutions and they can afford to be less selective and flexible when they screen potential borrowers.

However, formal sources of credit such as banks do not fund consumption but provide loans for business start ups/expansion suggesting a certain degree of segmentation. This indicates quite a high degree of exclusiveness of loans from the various sectors which results from asymmetric information limiting the extent to which formal lenders can monitor borrower activities (Hoff and Stiglitz, 1990).

Interest rates

Apart from the interest rates charged, there are no data on any other conditions imposed on loans by lenders such as interlinkages of contracts with other markets. The minimum rate was 0% while the maximum was 20%, with 33% of loans being interest free. The presence of extreme variability in the interest rate charged by lenders is one of the salient features of credit markets in developing countries (Banerjee and Duflo, 2001; Fafchamps, 2000). The mean interest rate is only 3.1%. It is argued elsewhere that informal loans with zero or small interest serve insurance purposes in the face of income variability (Fafchamps and Lund, 2003; Udry, 1991). The low interest rate in our sample is not due to the fact that a proportion of the population surveyed is significantly Islamic. In fact, Muslims constitute only 13.3% of all the households interviewed. Hence, the underlying reasons for the low use of interest rates are better understood when we link interest rates with sources of loan. As expected, friends and relatives lend without requiring interest payments. In addition, employers, credit associations, NGOs and governments give a small number of interest free loans. It is true that not all formal sector loans are interest bearing. Micro-finance institutions, banks and credit associations tend to charge interest across the whole range of rates while there is one case of friends and relatives charging the highest rate of 20%. Most of the rates provided by micro-finance institutions are small similar to the rates applied in group lending schemes elsewhere. The nature of interest rates seems to indicate that credit markets in urban Ethiopia are likely to be characterized by low interest rates as far as the informal lenders are concerned, however the consideration of default risk by these lenders is not altogether absent (Basu, 1983). This is in sharp contrast to the extensive literature on the dominance of exploitative informal moneylenders in credit markets of less developed economies. Our finding on interest rates charged by the formal sector does not also support the rationing hypothesis which is based on the assumption that formal credit is the cheapest credit available (Pal, 2002; Bell et al., 1997).

Loan amount and Household Characteristics

Households reported the loan amount they borrowed both in cash and in kind. The loan amounts reported in-kind has been converted into cash equivalents during the

interview and total borrowing per household is computed by adding the loans in cash and in-kind. The average annual loan amount of all households is 223 Ethiopian birr with a maximum of 50,000 birr. The majority of households borrowed amounts less than 10,000 birr. To investigate interesting relationships as summarized in Table 3, we linked the loan amount borrowed with some household characteristics. There seems to be little gender bias again, as females receive only slightly less than the mean total loan amount (213 birr) than males (230 birr). Total loan is found to be increasing in household size, but for very large households, it shows a decreasing trend. For ethnic groups such as the Gurage and especially Tigre, there appears to be a significantly larger mean of the total loan granted per household relative to other ethnic groups such as the Oromo and the Amhara. Households with Protestant heads also received higher mean loan amount than other households.

Table 3: Total Loan Amount (in Ethiopian birr) by Household Characteristics

Characteristics	Mean	Frequency (%)
<i>Gender</i>		
Male	230.25	832
Female	213.54	591
<i>Household size</i>		
1 to 5	160.85	667
6 to 10	270.56	683
Greater than 10	191.87	73
<i>Ethnic groups</i>		
Amhara	197.37	732
Oromo	136.97	258
Gurage	265.62	162
Tigre	386.72	157
<i>Religion</i>		
Orthodox	213.04	1147
Catholic	66.92	13
Protestant	311.54	52
Muslim	220.89	180
<i>Location</i>		
Addis Ababa	99.28	445
Non- Addis Ababa	32.03	328

Source: Authors' calculation from EUHS, 2000. The birr is the Ethiopian currency with an exchange rate of £1=20.38 and 1USD=13.53 as of 30/06/10.

Constrained households

Credit-constrained households in this study are defined according to the details given in section 3 above. Table 4 shows the number of constrained households. 293 households have applied for a loan and supplied their reasons for borrowing. 17 of these households have failed to report the status of their application. Therefore, they are excluded from the sample. Out of the original sample, 1179 did not apply for a loan and reported various factors that had deterred them from applying. The results show the presence of a high percentage of credit-constrained households in urban Ethiopia (26.6%) which points to the necessity of addressing the unmet demand for credit.

Table 4: Constrained Households

Type of households	Number (%)
Discouraged households	332 (22.8)
Households with rejected applications	15 (1.0)
Households that received a loan amount less than the amount they applied for	41 (2.8)
Households with successful loan applications	220 (15.1)
Total (including unconstrained households)	1455 (100)

It is evident that the discouraged constitute the highest proportion of the credit-constrained households. As the case in some other parts of the developing world such as Asia, this is not surprising because the banking sector in Ethiopia is dominated by bureaucratisation and buck-passing (Banerjee and Duflo, 2001). The two major reasons for discouragement are households' perception of the success probability of their loan application and lack of collateral. For instance, 47.9% of the discouraged borrowers did not apply because they believed they would not be successful while 32.8% of them did not apply because they did not have collateral. The interest rate (13%) and loan processing time (5.42%) were also mentioned as deterrents to applying.

5. Econometric Evidence

i. Standard Probit and Instrumental Variable (IV) probit models

In this section, we present our econometric estimation results. The empirical modeling of the determinants of access to credit or probability of being credit constrained (say P) can be handled by estimating a probit model due to the binary nature of the dependent variable. Assume an underlying latent response variable y_i^* which is defined by;

$$y_i^* = \beta' x_i + \mu_i. \quad (2)$$

In practice, we do not observe y_i^* but we can define a dummy dependent variable y which takes a value of either 1 if household i is credit-constrained or 0 otherwise. x_i represents a vector of household characteristics and the μ_i is a normally distributed error term with zero mean and constant variance.

However, one important empirical issue is the potential endogeneity of the household expenditure variable which is entered on the right hand side as one of the predictors of the probability of being credit constrained (see Table 5). Therefore, to control for endogeneity we adopted Amemiya's GLS (generalized least squares) estimator which is sometimes referred to as IV (instrumental variables) probit estimation (Newey, 1987). We used household income as an instrument. The endogeneity of expenditure is also a potential empirical issue in our tobit model of the amount of loan taken by households (see Table 6). In each case, we report the tests for the validity of our instrument using Smith and Blundell (1986) and Wald tests of exogeneity. In the IV probit context, equation (2) can be specified as

$$y_i^* = \gamma' y_i + \beta' x_{ei} + \mu_i \quad (3)$$

where y_i is the variable that is potentially endogenous (i.e. total household expenditure) which has a non-zero correlation with the error term μ_i ; x_{ei}

represents a vector of exogenous variables, γ and β are vectors of parameters to be estimated. Our independent variables (x) are grouped into four groups: (i) proxies for *current resources* such as total household expenditure and the value of household assets, (ii) proxies for *expected future income* such as years of schooling, (iii) *demographic variables* and (iv) *regional variables, squared and interaction terms*. The variables reflect both determinants of demand and supply of credit. Hence, we need to recognize the ambiguous effects of the demand and supply side variables as they might be at work simultaneously.

Table 5 presents the marginal effects of parameters of the standard probit and the IV probit models. Unsurprisingly, richer households have a lower probability of being rationed out of the credit market. A significant positive effect of the level of expenditure and a negative coefficient in the quadratic term indicate the presence of non-linear effects on the probability of being credit constrained. While at lower levels of expenditure the probability of being constrained increases as households increase their consumption and demand for credit. While the coefficient of the value of households' assets has the expected negative sign and is significant at the 5% level, its impact on the probability of being credit constrained is rather small (close to zero). Expected future income, measured by the number of years of schooling has a negative but insignificant effect.

Households with dependent children between the age of 6 and 15 and that live in the capital city, Bahir Dar, Dessie, Dire and Jimma are more likely to be credit constrained. The presence of more dependents in households may discourage lenders because it signals higher desired consumption instead of investment, limited earning capacity and higher probability of default. Marital status and gender dummies were insignificant, the latter implying no gender bias in urban credit access confirming our findings in the descriptive section. Location matters in accessing loanable funds. Relative to Mekelle, households in Addis Ababa, Bahir Dar, Dessie, Dire and Jimma are more likely to be credit constrained suggesting the presence of regional variations in the ways credit markets function in the country. This might also relate to availability of credit provision services in Mekelle relative to other cities.

Table 5: Probit models predicting the probability of being credit constrained

Models	Probit model	Instrumental Variables
		Probit Model
Variable	Marginal Effects (t-value)	Marginal Effects (z-value)
Expenditure	0.262** (2.35)	4.987 (1.56)
Expenditure squared	-0.025*** (2.90)	-0.351** (1.70)
Assets	-0.000** (2.27)	-0.000*** (2.95)
Assets squared	-0.000 (0.64)	-0.000 (1.51)
Expenditure*Assets	0.000** (2.07)	0.000*** (2.52)
Years of schooling	-0.003 (0.43)	-0.027 (1.07)
Age	0.002 (0.34)	0.135 (1.32)
Age squared	0.000 (0.27)	0.000 (0.10)
Age*Expenditure	-0.001 (0.66)	-0.022 (1.38)
Household size	-0.003 (0.48)	0.007 (0.27)
Children under 6	0.010 (0.52)	-0.009 (0.14)
Children between 6 and 15	0.020* (1.78)	0.032 (0.67)
Adults between 16 and 54	-0.003 (0.29)	-0.024 (0.029)
Married	0.020 (0.64)	0.026 (0.25)
Female	-0.018 (0.60)	-0.105 (1.07)
Addis	0.268*** (3.65)	0.843*** (2.42)
Awassa	0.170 (1.26)	0.508 (1.58)
Bahir Dar	0.381*** (3.07)	0.961*** (2.74)
Dessie	0.425*** (3.53)	1.078*** (3.00)
Dire	0.391*** (3.25)	1.180*** (4.04)
Jimma	0.272*** (2.12)	0.715** (2.21)
Number of observations	1384	1384
LR chi ² (21)	80.28	
Prob> chi ²	0.0000	
Wald test of exogeneity: chi ² (1)		1.06
Prob> chi ²		0.30
Smith-Blundell test of Exogeneity chi ² (1)		1.02
Prob> chi ²		0.31

N.B.: (i) Variables 'Adults > 55' and 'Mekelle' are omitted demographic & location variables to ensure identification. (ii) *=Significant at the 10% level;**= Sig. at the 5% level; and ***= Sig. at the 1% level. (iii) In the IV specification the income variable is used to instrument for expenditure.

ii. Standard Tobit and IV Tobit models

In this study, we also investigated the factors affecting the volume of loan accessed by households and its determinants using tobit and IV tobit models. To allow for the censored nature of the dependent variable, we have estimated a tobit model assuming a correlation between the unobservables affecting households decision to borrow with their decision on how much to borrow. Since the model of the determinants of the volume of loan amount can be perceived as a model of credit demand, it is not reasonable to exclude households with zero loan amounts. The tobit model handles the potential selectivity bias or non-random choice of borrowing households that can if we exclude households with zero loan amount. In addition to adopting the tobit model to handle selectivity bias, we estimate the IV tobit model to account for the endogeneity of the household expenditure variable. The IV tobit model to estimate can be defined as:

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

$$y_i^* = y_i\beta + x_{ei}\gamma + \mu_i = z_i\delta + \mu_i \quad (5)$$

where y_i^* denotes the dependent variable (i.e. loan amount), y_i is the variable that is potentially endogenous (i.e. total household expenditure), and the rest of the variables are as defined earlier.

Table 6 reports the marginal effects of parameters of both the standard tobit and IV tobit models. While it can be of use to analyze the determinants of loan amount from the borrower's perspective, thereby reflecting the behavior on the demand side of the credit market, the variables collected here are those determinants which are likely to be used from the lender's perspective to screen the borrowers. Given this, the econometric analysis allows us to highlight the extent of rationing that occurs once the lender has decided to lend. The explanatory variables in the tobit model represent the determinants of rationing mostly on the supply side of the

market. The relative strength of the demand side factors as compared to supply side influences depends on the relative bargaining power of borrowers and lenders. However, the main influence on the total loan amount granted is likely to be the degree to which the lender expects the borrower to repay or default.

Table 6: Tobit models of loan amount received by households

Models	Tobit model	Instrumental Variables
	Marginal Effects (t-value)	Tobit Model Marginal Effects (z-value)
Expenditure	2078.88* (1.66)	-4897.45 (0.33)
Expenditure squared	-105.65 (1.09)	356.85 (0.36)
Assets	-0.90*** (4.25)	-0.72* (1.67)
Assets squared	-0.00*** (1.97)	-0.00 (0.37)
Expenditure*Assets	0.12*** (4.04)	0.09 (1.13)
Years of schooling	-0.20 (0.00)	27.14 (0.32)
Household size	-111.66*** (1.91)	-141.54 (1.62)
Collateral	0.68*** (12.63)	0.70*** (10.68)
Age	18.56 (0.31)	-190.58 (0.43)
Age ²	0.60* (1.93)	0.62* (1.92)
Age*Expenditure	-13.31 (1.59)	20.13 (0.28)
Children under 6	133.19 (0.83)	204.53 (0.92)
Children between 6 and 15	260.46*** (2.75)	301.30*** (2.32)
Adults between 16 and 54	116.27 (1.55)	150.70 (1.42)
Married	-401.00 (1.52)	-355.04 (1.23)
Female	116.27 (0.45)	204.52 (0.63)
Non-Addis	-350.58* (1.63)	-522.12 (1.23)
LR chi ² (17)	184.78	
Prob> chi ²	0.00	
Wald test of exogeneity: chi ² (1)		0.22
Prob> chi ²		0.63
Smith-Blundell test of Exogeneity chi ² (1)		1.32
Prob> chi ²		0.25

N.B.: (i) Variables 'Adults above 55' and 'Mekelle' are omitted to ensure identification. (ii) *=Significant at the 10% level; **= Significant at the 5% level; and ***= Significant at the 1%

level. (iii) In the IV model, the income variable is used to instrument for expenditure. From Table 6, it is clear that current resources, the value of collateral, and the presence of number of children aged between 6 and 15 are significant positive factors in affecting the volume of loan households received. The positive effect of households' welfare position on the size of the loan is similar to the evidence identified elsewhere (Gill and Singh, 1997). The estimation also reveals a significant quadratic relationship between the age of the head and the volume of loan. Except for the sign of the negative value of the assets coefficients, our results are consistent with our a priori theoretical conjecture about the loan amount supplied by lenders. The results reveal an absence of gender, ethnic and religious discrimination in loan allocations in urban areas of Ethiopia. However, the negative "non-Addis" coefficient suggests the presence of discrimination in the volume of loan received, in favor of the capital city. This highlights the importance of credit as an integral part of any effective poverty reduction strategy, which aims to combat uneven regional development in Ethiopia. Recent credit schemes that target the elderly in the capital city through the Sustainable Development and Poverty Reduction Program (SDPRP) of Ethiopia proved to be successful in reducing old age poverty (Baleher and Yirsaw, 2003). Therefore, extending similar initiatives to other households in other regions can be an effective poverty reducing strategy.

5. Conclusion

Following Jappelli (1990), we extended the definition of credit constrained households in an empirical context using a large household survey undertaken in urban Ethiopia. Drawing on a unique dataset, our econometric methods were applied to estimate (with and without controlling for endogeneity of households' current resources) the determinants of households' probability of being constrained and the volume of loans accessed by the households.

Our analysis reveals that urban credit markets in Ethiopia are segmented. The informal sector is not only the major source of loans in rural areas but also in major urban centres. Most of the credit constrained households are the discouraged. Hence the removal of barriers by restructuring the banking sector via reduced bureaucracy and transaction costs should be a viable route to enable households' access to credit. This restructuring should be an integral part of an overall

government policy that includes a wide range of policy initiatives designed to revitalise small business and entrepreneurship. These policy initiatives should target bottlenecks for self-employment through the provision of finance and business support in the form of training, information provision regarding management and marketing skills, and relaxation of locational regulations for new entrepreneurs. The expected outcome of these policies is twofold. Firstly, they would exploit the entrepreneurial potential of emerging businesses. Secondly, they are expected to reduce unemployment and the costs of social programmes associated with it. In this context, Alvi and Dendir (2009) examined the role of private transfers and loans on risk management in urban areas in Ethiopia. We argue that investigating what determines credit access is extremely crucial to estimate the impact of private transfer or loan receipt equations and the overall policy implications on the welfare of households.

Our results also showed that informal finance provide valuable services to those excluded from capital access through saving mobilisation, especially among neighbours, friends and relatives. This is in line with other studies that highlight the important role played by informal institutions in reaching out to the excluded and to address the enormous challenge of unemployment (De Gobbi, 2006; Matin et al., 2002). However, traditional financial systems in Africa usually undertake minimum intermediation and often specialize in either deposit-taking or lending. Therefore, an integral aspect of targeted intervention should include social inclusion programmes to fill the vacuum.

Another interesting result is the absence of gender, ethnic and religious discrimination in loan allocations. The significance of current household resources both in affecting credit access and the volume of loan borrowed provides justification for government's targeting of economic exclusion. The excluded or constrained households are the poor, uneducated and households with children. These results emphasize the significance of the socio-economic milieu and discrimination in the labour markets as significant factors in understanding credit constraints in urban Ethiopia. Equally, the negative "non-Addis" coefficient suggests the presence of discrimination in the volume of loan received, in favor of the capital city. This highlights the importance of credit as an integral part of any effective poverty reduction strategy, which aims to combat uneven regional development in

Ethiopia

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CHILDREN'S EDUCATIONAL COMPLETION RATES AND DROPOUTS IN THE CONTEXT OF ETHIOPIA'S NATIONAL POVERTY REDUCTION STRATEGY¹

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Abstract

Using a young Lives project data³, a combination of quantitative and qualitative method was used to analyse the determinants of school completion/dropout of children from primary education. A Cox box proportional hazard model was used to analyse the survival of children in primary education. The findings have important implications for the formulation and revising Ethiopian Poverty Reduction Strategy Paper.

*While the policy focus of the 1996-initiated ESDP and the SDPRP (2002-5) on increasing educational access for all has been broadly successful, children from poor and/or highly indebted families still face significant constraints because they have to contribute to household survival through paid and unpaid work. It is, therefore, imperative to increase efforts to improve the livelihood options of the poor, including greater income generation opportunities, particularly in rural areas and for women. However, such strategies need to be child sensitive. For instance, income generating opportunities for women should simultaneously be accompanied by **community childcare systems** in order to prevent older children from shouldering their mother's childcare burden.*

Keywords: education; children; Ethiopia; PRSP; poverty; survival analysis.

JEL Classification: A2; D1; J2;

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³ Young Lives is an international study of childhood poverty that follows 12 children in four countries namely Ethiopia, India, Vietnam and Peru (for details of the young Lives look at www.younglives.org.uk)

1. Introduction

The major development objectives of the Ethiopian government are to reduce poverty and improve primary school enrolment (GoE, 2002). However, to date education performance indicators show that only access-related targets (gross enrolment of 65 per cent by 2004/05) have been achieved. Gross and net primary enrolment rates increased from 45 and 21 per cent in 1995/96 to 61 and 34 per cent in 1999/00 and to 74 and 38 per cent in 2004 (Ministry of Finance and Economic Development (MoFED, 2005). However, primary school dropout rates in 1999/00 almost doubled in 2003/04 from 9 per cent to 19 per cent. Although this figure declined again to 12 per cent in 2004/05, it fell well short of the 2004/5 target of 4.2 per cent. According to recent report by the Ministry of Education (Moe, 2010), the primary school (grade 1-8) dropout went up to 12.4 in 2006/07 and 14.6% in 2007/09 while primary completion rate has stagnated around 44 from 2006/07 to 2008/09 indicating that higher primary school dropout and lower completion rate are still conspicuous problems of the Ethiopian Education system.

Literatures indicate that school completion plays a crucial role in shaping a child's future economic opportunities and social destiny. Moreover, it also has wider implications for a country's human capital development objectives (Vitaro *et al.*, 1999; Prevatt and Kelly, 2003). Grade repetition and school dropouts are major sources of inefficiency in any education sector (Hanushek and Lavy, 1994). This is of particular concern given that the literature from developing countries suggests that dropouts are generally higher in the first year of primary education because problems experienced during a child's preschool years will be reflected in the first grade (Bustillo, 1989; World Bank, 1998). Research strongly supports the view that dropping out is a dynamic developmental process that begins before children enter elementary school, and is linked at least in part to parental expectations about education (Jimerson *et al.*, 2000). Because of its wider implications, it is important to study the determinants of school dropouts at the household-, community-, regional- and national levels in order to devise appropriate corrective measures.

To our knowledge, there are no country-level studies that examine the determinants of dropout rates or assess the impact of the new Ethiopian educational policy on education outcomes. In order to address this lacuna, this paper addresses the

following specific research questions:

- 1 What is the relative importance of individual child, family and school characteristics in determining grade completion and dropouts in primary school?
- 2 To what extent are the components of the Education Sector Development Programme (SDPRP) consistent with the determinants of children's primary school completion rates identified in this paper?
- 3 What policy implications are raised with a view to contributing to debates around the revised SDPRP (2006-10)?

The paper uses quantitative and qualitative techniques to analyse school completion/dropout rates using used Young Lives survey data children and their households collected by the Ethiopian *Young Lives* Project in 2002. The quantitative data were collected from 20 sentinel sites in five regions in 2002: Addis Ababa, Oromia, Tigray, Amhara and SNNP, which together comprise the majority of the Ethiopian population (96 per cent). Forty per cent of the children were from urban areas and the remaining 60 per cent from rural areas. Qualitative data was collected in 2005 from five of the 20 sites.

The paper is organised as follows: Sections summarizes the reviews of literature. Description of data and model used is provided in section 3. Section 4 presents the quantitative and qualitative research results. Summary of the findings and conclusions together with policy implications for the second phase of the Ethiopian poverty reduction strategy is provided in section 5.

2. Literature Review on Primary Completion Rate and Dropout Rates

Review of literature indicates that dropout of children from school depends on a number of factors including child specific characterise, household composition, parents education, community characteristics in which the child is living, and policy factors.

A child's age, gender, IQ and cognitive skills, popularity and peer relations, academic achievement, nutritional and health status are the main characteristics highlighted in the empirical literature on primary completion and dropout rates (Hanushek and Lavy, 1994; Jimerson *et al.*, 2000; Farmer *et al.*, 2003). **Age** is relevant because it is

related to learning abilities, and whether or not a child starts his/her education on time or over-age. It is a good predictor of education attainment (Holmes, 2003).

The **gender** of a child is important for several reasons. Households commonly prefer to invest in boys' rather than girls' education. The main reason for this gender discrimination is the low perceived returns to schooling for girls because they usually leave their natal home when they marry. Parents' concerns for girls' safety at school – and while travelling between home and school – can also lead to the forced withdrawal of girls or to them dropping out voluntarily when they reach puberty (Oxaal, 1997).

The **innate learning abilities** of a child are also important because they increase the productivity of those parents investment in their offspring's education. For example, Jimerson *et al.* (2000) found that children with lower IQs and poor academic achievements were more likely to dropout of high school than their more academically gifted counterparts. Similarly, higher achievements and cognitive skill were found to reduce the likelihood of dropping out in Egypt (Hanushek and Lavy, 1994).

The **nutritional and health status** of children was also found to be a strong predictor of school attendance (and in turn school performance) (Silverstein *et al.*, 2001).⁴ Jamison (1985) observed a strong negative relationship between a poor nutritional condition (measured by low height-for-age and weight-for-age) and children's grade completion rates in China. One standard deviation reduction in height-for-age of a child was associated with a retardation of one-third of a year of schooling, which could be due to delayed enrolment or grade repetition. Similarly, poor school attendance and low achievement of students were significantly associated with under-nutrition and hunger in the Philippines (Glewwe *et al.*, 2001, cited in Mukudi, 2003), Chile (Ivanovic *et al.*, 1996, cited in Mukudi, 2003), and Kenya (Mukudi, 2003).

⁴ We do not include this variable in our regression model as these data were not available for all the children in the sample (7-17 years). However, nutritional concerns did emerge in some regions in the qualitative research.

Income, assets and family structure are the main household characteristics identified in the literature that impact on school completion rates. Household wealth clearly determines a household's ability to invest in the education of the child. The likelihood of children dropping out of school depends on the level of opportunity costs incurred by parents by them being in school (Appleton, 1991, cited in Bredie and Beeharry, 1998). Children with greater opportunities to earn income are likely to be taken out of school and involved in work if parents need additional income (Hanushek and Lavy, 1994).

Household structure is important because household resources are needed to pay for the education of children. In the Ethiopian context, for example, Woldehanna *et al.* (2005) observed a negative relationship between birth order and schooling, suggesting that younger children may be paying for the education of the older ones. In addition, it has been observed that female-headed households, and households where mothers have more decision-making power, tend to make decisions in favour of child schooling. When female decision-making power is combined with higher maternal education levels, children are more likely to be enrolled (Holmes, 2003; Kabeer, 2003). The distribution of decision-making power within the household is, therefore, important in determining children's enrolment patterns.

The findings on **parental education** are mixed. First, children whose parents are educated are more likely to learn because they live in an environment which is usually more intellectually stimulating. Secondly, parents who are more educated, may value education more than less educated parents which, in turn, influences the chances of a child of being enrolled and progressing in school. However, in addition to parental education, other factors such as resource availability and high returns to schooling are also important in explaining children's school enrolment. For example, Hanushek and Lavy (1994) found that the impact of parental education on the probability of dropouts in developing countries was not significant (Hanushek and Lavy, 1994).

The **education of other household members**, besides the parents, also matters in determining final decisions about children's education. Desforges and Abouchaar, (2003).concluded that parental involvement in children's education has a powerful impact on their attainment and adjustment in education. Similarly, Escobal *et al.*

(2005), in the case of Peru, found that the education level of female adults in the family (not just the caregivers) was positively associated with children's educational outcomes. In addition, **parental aspirations** are important, because parents may want their children to achieve high levels of education, independent of any economic return. Parents may believe that education has a value in itself, as is the case for health (Alderman and King, 1998).

The most important school characteristics are the costs to households, the distance from a child's home and the quality of the school. **School fees and other schooling-related costs** (like uniforms, books and stationery) are obviously crucial in determining the returns to schooling (Brown and Park, 2002). **Distance to school** is also important because long distances increase the opportunity costs of attending school by reducing the potential number of hours of work a child might do; it also potentially reduces a child's ability to learn if s/he is tired after a long walk to school (Tilak, 1989; Glewwe, 1999).

The **quality of education** is important because returns to schooling depend on the child's acquisition of basic skills like reading, writing and arithmetic. If the household perceives that the school cannot provide children with such basic skills, it may decide that an investment in education is not worth the small return (World Bank, 2004). Very poor school quality may thus discourage households from educating their children, and encourage them to allow their children to work instead. School quality variables include: the number of schools available in the community, the level of education of the teachers, the pupil/teacher ratio, and the availability of books, desks, blackboards, water and toilets. For example, Hanushek and Lavy (1994) found that in Egypt, school quality had an important influence on students' dropout decisions. Students attending higher quality schools tend to stay in school longer and complete higher grades.

Government policies may affect completion rates by influencing both the demand for, and supply of, education. Key policies may include: starting age regulations, legislation to make school compulsory, education sector funding, curriculum development, school timetabling, grade promotion policies (Lillard and Decicca, 2001) and teacher training (World Bank, 2004).

Neighbourhood characteristics are an important element of the community context which affects dropouts (Crowder and South, 2003). Crowder and South found higher dropouts as the concentration of poverty and socio-economic distress in a neighbourhood increased, although these results were conditioned by such factors as duration of residence in the community, household features such as income-level and individual characteristics such as age and gender.

Other key community environmental factors include the relative availability of job opportunities, dominant livelihood strategies (e.g. pastoralist versus agriculturalist) (Tilak, 1989), and urban/ rural location. In the latter case, Hanushek and Lavy (1994) found that rural location in Egypt increases the probability of dropouts (Hanushek and Lavy, 1994).

3. Description of Data and Model

We used Young Lives survey data of children and their households collected by the Ethiopian *Young Lives* Project in 2002. The data were collected from 20 sentinel sites in five regions in 2002: Addis Ababa, Oromia, Tigray, Amhara and SNNP, which together comprise the majority of the Ethiopian population (96 per cent). From each sites 100 of one year old children were selected randomly. Forty per cent of the children were from urban areas and the remaining 60 per cent from rural areas.

Qualitative research was carried out in five of the twenty *Young Lives* sites in February and March 2005 to complement the quantitative findings. One site from each of the five regions represented in the *Young Lives* sample was selected, four of which are rural and one urban. A combination of focus group discussions, semi-structured in-depth interviews and key informant interviews were carried out in each site over a four-week period.

Description of data. Out of the total sample of children, 66 per cent have, at some time, been enrolled in school. Of these children, about 61 per cent were still in school, and the rest were no longer enrolled because they had either graduated or dropped out before completion. Of those children who had been enrolled at some point, 17 per cent dropped out of school before completing. Girls' dropout rate (51 per cent) was marginally higher than boys' (49 per cent). Surprisingly, the dropout

rate was lower in rural than urban areas (12 per cent compared to 25 per cent). Comparing regions, the greatest dropout rate was observed in Addis Ababa city (31.24 per cent), followed by SNNP (19.93 per cent), while the lowest dropout rate was in Tigray Region (7.08 per cent). There was a systematic relationship between dropout rates and the poverty status of a child's family. The proportion of children who dropped out of school seems lower for children from *very poor* households (12 per cent) than those from *poor* households (23 per cent) and *less poor* households (30 per cent), but since this is a descriptive work, not multivariate, the result will change when we account for other mediating factors. Tables 1 and 2 tabulate the number of dropouts by sex, location, regions and poverty status of households.

Table 1: Dropout rate by location, sex and poverty status of households (percentage)

		Location		Sex		Poverty		
		Rural	Urban	Girl	Boy	Very poor	Poor	Less poor
Still in school	82.85	88.49	74.8	82.01	83.65	87.8	77.39	70
Dropped out	17.15	11.51	25.2	17.99	16.35	12.2	22.61	30

Source: Young Lives study

Sample children were also asked when they first started school. Thirty-four per cent of children said they did not know when they started school. However, of those who did know, the largest proportion (40 per cent) said they started school at the age of seven, and 27.34 per cent started at the age of six. Only a very small proportion of children started school at the age of three (0.45 per cent) and 4.71 per cent at the age of four. The gender differences in school starting age are negligible. The proportion of rural children who started school at the age of eight (one year later than the official starting age of seven) is twice that of urban children. Only 5 per cent of rural children started school at the age of five; the corresponding figure for urban children is 14.4 per cent. Table 4.4 describes school starting age by sex and location.

Table 2: Dropout by Region (percentage)

	Addis Ababa	Amhara	Oromia	SNNP	Tigray	Total
Still in School	68.76	89.18	83.31	80.07	92.92	82.85
Dropped out	31.24	10.82	16.69	19.93	7.08	17.15

Source: Young Lives study

Table 3: School Starting Age by Sex and Location (percentage)

Age	Girl	Boys	Rural	Urban	Total
2	0	0.5	0.22	0.27	0.25
3	0.6	0.3	0	0.81	0.45
4	4.47	4.96	1.22	7.55	4.71
5	9.04	11.51	5.2	14.39	10.27
6	25.92	28.77	20.71	32.73	27.34
7	40.71	39.38	48.73	33	40.05
8	19.27	14.58	23.92	11.24	16.92
Total	100	100	100	100	100

Source: Young Lives study

Description of the model. We used a Cox proportional hazard model to analyse the determinants of school attainment. We could have used a censored ordered probit model devised by Lillard and King (quoted in Glewwe, 1999; Holmes, 2003; World Bank, 2004) to identify the determinants of school completion. However, the use of censored ordered probit models to analyse school attainment of children assumes that a child currently enrolled will achieve at least the grade level in which the child is currently. This is too restrictive an assumption, especially in a situation where there is a significant dropout rate. The alternative is to use a Cox proportional hazard model to analyse children's school attainment or dropouts (Cox and Oakes, 1984). Hazard models account for the dependence of current enrolment on past enrolment decisions, and handle censored students (i.e. children enrolled at the time of the survey). The Cox hazard model does not require a parametric specification of the baseline hazard function and thus allows the baseline hazard rate for each community to vary (Cox and Oakes, 1984; Brown and Park, 2002). Therefore, we used a Cox proportional hazard model to analyse the determinants of school attainment and completion rates. We estimated a hazard model of dropping out of school, conditional on current enrolment of children in school. We analysed the determinants of school attainment using data on the 3,074 eight-year-old children and their families included in our sample.

In our analyses, we estimated different Cox regressions. The model estimates a hazard model for dropping out of school conditional on current enrolment among

children from the total sample (Brown and Park, 2003)⁵. The Cox proportional hazard model provides estimates of hazard ratio which is interpreted as a risk multiplier. For example, a hazard ratio of 1.5 means that a child is 1.5 times more likely to drop out if the independent variable increases by one unit. Hence, hazard ratio greater than one corresponds to positive coefficient and hazard ratio less than one, corresponds to negative coefficient. The Cox model also, by definition, assumes that the hazard ratio is proportional over time. Hence, it is necessary to evaluate the validity of the assumptions.

We also estimated separate hazard models for rural and urban children, as well as for girls and boys. Prior to making these estimations, we conducted the following tests: first, we tested whether the survival function for both sexes is the same as for rural and urban children. The graphical assessment also shows that the assumption of the Cox proportional hazard model has not been violated. The Log-rank test for equality of survivor functions between the sexes cannot reject the null hypothesis, but it rejects the equality of the survival function between the rural and urban child. On the other hand, the test for whether the proportional hazard assumption holds for our model indicates that the global test rejects the proportional hazard assumption, but that the individual covariate test result does not reject the assumption. Moreover, our conditional index result shows that multicollinearity is not a problem in our dataset since we obtained a conditional index of 20 when we exclude age squared of a child. When a child's age squared is included, the conditional index was calculated to be 51, which indicates that the multicollinearity problem is very serious (Belsley *et al.*, 1980).

In addition to the Cox proportional hazard estimation, we also estimated an ordered probit model for years of schooling in order to compare the results. In the ordered probit model estimation, the outcome represents increasing years of completed schooling achieved by the child. Table 5 presents the results from the Cox proportional hazard models of the likelihood of a child dropping out from school at each level estimated from the total sample. The table shows hazard ratios and the

⁵ Hazard models account for the dependence of current enrolment on past enrolment decisions and handle students currently enrolled at the time of the survey as 'right censored'. For example, if a student is currently enrolled, we do not know whether s/he will drop out in the future before completion of primary school. In econometrics, accounting for this uncertainty is termed 'right censored'.

estimated coefficients for the hazard model, as well as the estimated coefficients of the ordered probit model. The results of the Cox regressions for girls and boys, as well as for rural and urban children, are presented in Appendix. The following discussion is based on the Cox regression estimation made on the total sample but, whenever necessary, we also include the results of the ordered probit and from separate Cox regression for both sexes and for urban and rural children. The descriptive statistics for the variables included in the regressions are shown Table 4. In all regressions, we included dummies for regions to control for unobservable factors, including the cultural and geographical characteristics of each region and any variation in education policies, as regional governments are responsible for the organisation and support of the education system in their region.

4. Results and Discussion

This section weaves together the results of the multivariate and qualitative analyses of the determinants of primary school attainment or dropout to provide as comprehensive picture as possible. Descriptive statistics of variables used in the regression and result of the survival analysis are presented in Tables 4 and 5. Separate regression results for rural and urban areas and for male and female headed households are given in Table A1. And Table A2 in the Appendix.

Table 4: Summary statistics of variables included in Cox regression

Variables	No. of observations	Mean	Standard deviation	Minimum	Maximum
Age	3078	15.7755	6.83236	5	30
Age squared	3078	295.5325	244.3307	25	900
Wealth index	3074	0.183112	0.160973	0.005051	0.766234
Dummy for urban residence	3074	0.412817	0.492421	0	1
Mother's years of schooling	3074	0.562134	1.024692	0	5
Father's years of schooling	3074	0.814574	1.260466	0	5
Cognitive social capital	3074	1.897202	0.329441	0	2
Absolute structural social capital	3074	1.649967	1.235046	0	7
Number of organisations from which one gets social support	3074	2.373455	2.620185	0	12
Citizenship	3074	0.529928	0.499185	0	1
Dummy for debt	3078	0.361274	0.480448	0	1
Dummy for Amhara region	3074	0.159401	0.36611	0	1
Dummy for Oromia region	3074	0.200716	0.400601	0	1
Dummy for SNNP region	3074	0.292128	0.454815	0	1
Dummy for Tigray region	3074	0.190306	0.392606	0	1

Variables	No. of observations	Mean	Standard deviation	Minimum	Maximum
Dummy for child work	3074	0.08946	0.285453	0	1
Dummy for bad events	3074	0.778139	0.415566	0	1
Dummy for male household head	3074	0.817176	0.386585	0	1
Dummy for land ownership	3074	0.590111	0.491893	0	1
Dummy for livestock ownership	3074	0.729994	0.444035	0	1
Distance to public or private school in km	3074	2.329234	2.794606	0.5	9.166667
Birth order	3078	3.877843	2.011671	1	12
Male HH members over 15 years old	3074	1.708198	1.122682	0	5
Female HH members over 15 years old	3074	1.72121	0.959661	0	6
Male HH members between 1 and 5 years old	3074	0.486988	0.659847	0	3
Male HH members between 5 and 15 years old	3074	0.990241	0.918357	0	4
Female HH members between 1 and 5 years old	3074	0.440468	0.615878	0	3
Female HH members between 5 and 15 years old	3074	1.1311	0.968788	0	6
Dummy for male child	3074	0.510085	0.49998	0	1

Table 5: Determinants of dropouts using full sample (Censored Cox Regression of dropout)

	(1) Hazard ratio	(2) Coefficient
Dummy for Amhara Region	0.594*** (3.71)	-0.521*** (3.71)
Dummy for Oromia Region	1.009 (0.08)	0.009 (0.08)
Dummy for SNNP Region	1.020 (0.20)	0.019 (0.20)
Dummy for Tigray Region	0.699*** (2.82)	-0.357*** (2.82)
Dummy for urban residence	0.874 (0.98)	-0.135 (0.98)
Wealth index consumer durable	0.423*** (2.70)	-0.860*** (2.70)
Male dummy 1 if male and 0 if female	0.847*** (3.27)	-0.166*** (3.27)
Age of a child	1.016*** (5.34)	0.016*** (5.34)
HH Size below 5 years old	1.207*** (6.05)	0.188*** (6.05)
HH Size between the ages of 5 and 15	0.891*** (5.11)	-0.115*** (5.11)
HH Size above the age of 15	0.905*** (4.64)	-0.099*** (4.64)
Grades completed by fathers	0.971*** (3.38)	-0.030*** (3.38)
Grades completed by mothers	0.973*** (2.75)	-0.027*** (2.75)
Dummy for male HH head	1.054 (0.65)	0.052 (0.65)
Number of events that decreases the HH welfare	0.975* (1.83)	-0.025* (1.83)
Cognitive Social Capital	1.014 (0.42)	0.014 (0.42)
Absolute structural social capital	1.001 (0.03)	0.001 (0.03)
# of organisations providing social support	1.010 (0.71)	0.009 (0.71)
Citizenship social capital	0.946* (1.71)	-0.055* (1.71)
Dummy for debt	1.166*** (2.88)	0.154*** (2.88)
Dummy for HH owns or rents land	1.168 (1.43)	0.156 (1.43)
Dummy for ownership of livestock	1.059 (0.83)	0.057 (0.83)
Mean distance (in kilometre) to public or private primary schools	1.042*** (2.66)	0.041*** (2.66)
Policy dummy 1 if child was in school before 1997	0.259*** (24.30)	-1.350*** (24.30)
Observations	3074	3074

*Robust z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at %*

Rural/urban and regional differences

The variable dummy for urban residency was found to have a negative effect on dropout rates, indicating that urban children are less likely to drop out of school compared to rural children. This result is statistically significant when the estimation is disaggregated by regions and it holds true for all regions indicating that much still needs to be done to decrease the probability of rural children dropping out of school – both in terms of improving the availability and quality of schools as well as reducing pressures on children to contribute to labour activities. The effect of urban residency was the same for boys' and girls' school attendance has increased significantly in recent years (from 17% in 1995/96 to 63% in 2004/05 (MoE, 2005), there is still a marked gender gap in urban and rural areas (Welfare Monitoring Survey (CSA, 2005) indicated that net enrolment rate is 33% for rural areas and 77 for urban areas).

Turning to regional differences, the result of the Cox regression on the total sample indicated that children in the Amhara and Tigray regions are less likely to drop out of school. This result is consistent with the results obtained from the qualitative survey in the two regions, which indicate that in Amhara the regional government uses enforcement mechanisms to promote school attendance (e.g. by depriving households of government social services if they do not send their school-aged children to school). In Tigray, parents reported sending their school age children to school as they have become convinced that schooling is an investment in their future livelihood.

Child characteristics

Only two child-specific characteristics emerged as important determinants of school attainment: age and gender. Children's **age** has a significant and positive effect on the probability of a child dropping out of school. Older children are more at risk of dropping out of school and are less likely to attain more years of schooling compared to their younger counterparts. Our qualitative findings further suggest that if children attend school when they are relatively old (for their grade), it is because parents are less financially capable and/or willing to support their children's education. For example, a father in Tigray noted that older children in poor

households typically have a responsibility to support their brothers' and sisters' school attendance. Moreover, even if such children did attend school, they would be more likely to be withdrawn in the case of economic pressures than younger siblings because of their ability to contribute more to household economic production.

Our Cox regression results found that the variable for the child's **gender** had a significant effect on primary school dropouts, with boys less likely to drop out than girls. Our qualitative results strongly suggested that this gender difference is attributable to traditional distinctions in the way households and communities value girls' and boys' education. Because boys are viewed as future breadwinners not only for their own future children, but also to support their parents in old age, boys' education is valued over that of girls whose primary role is regarded as wives and mothers to support their husbands' family.

Similarly, a female student noted that people's reactions to girls' education, especially when it involves travelling to the nearby town or staying there, is discouraging as educating females is often considered "*as a futile exercise or worthless*". Nevertheless, it is important to point out that while our quantitative data were collected in 2002, the qualitative data from 2005 suggest that important changes are happening largely as a result of new legal and policy developments designed to advance gender equality. Perhaps, most significant among these is the Family Law reform of 2001 (implemented in 2002) which banned marriage under the age of 18. Traditionally, parents have been eager to marry off their female children early, not only for economic reasons but also for the sake of family pride associated with female chastity. Because girls are commonly subject to sexual assault, abduction and rape in public spaces, parents preferred to have their daughters drop out of school early and get married, in order to protect the family honour.

While our Cox regression result and descriptive analysis (using *Young Lives* data collected in 2002) show that dropout rates are higher among girls than boys in primary education, our qualitative assessment (conducted in 2005) and national data (CSA, 2005) found that dropouts from primary school are higher among boys than among girls due to greater pressures to be involved in productive work to support the family economy. Because of gender discriminatory labour markets, higher remuneration for boys and a traditional gender division of labour where boys

are more involved in agricultural than domestic work (although not exclusively), there are increasingly greater incentives for parents to take their sons, rather than daughters, out of school.

Family characteristics

Parental education, household composition, household wealth and exposure to shocks, as well as maternal social capital, all emerged as important family-level determinants of school attainment.

Parental education

The Cox regression results indicated that the variable “years of schooling” of both parents significantly and negatively affects the probability of their children dropping out of school: children of educated parents are more likely to stay in school than their counterparts. However, if we disaggregate the estimation by children’s gender and by rural / urban location, higher levels of maternal education only have an impact on rural children and girls, whereas fathers’ educational levels are important regardless of location and the sex of the child. Disaggregating the estimation by female- and male-headed households shows that children from both male- and female-headed households are equally less likely to drop out from school when the mothers’ education level increases.

Some respondents in our qualitative interviews noted that the correlation between parental education and lower dropout rates was because educated parents were more supportive of education and gave children more time to study, and because of the linkages between education and wealth.

Interestingly, however, overall our qualitative research suggested that parental commitment to their children’s education was at least as significant as parental educational achievement in promoting school attainment.

Reasons behind parental commitment to education varied. They included a sense of economic necessity and security in old age, pressure from local authorities, a desire to provide their children with opportunities that the parents were denied and a sense of moral responsibility.

For many parents, there are important linkages between education, morality and personal development. Parent's commitment to education is also related to a sense of moral responsibility: that allowing children to go to school is a parental duty and is the most valuable inheritance a child can receive.

Family composition

The Cox regression indicated that the likelihood of a child dropping out of school is significantly and negatively associated with the number of older siblings in the household (above 5 years of age)⁹ and the number of household members over 15 years of age. This suggests that older siblings and adult members substitute for each other's household labour or provide complementary support through cost savings and/or improved learning. However, the effect of older siblings is not statistically significant for children from female-headed households and for urban areas. Conversely, a child's likelihood of dropping out of school is significantly and positively associated with the number of children under five years old in the household, suggesting that older children may be required to take care of children and be under pressure to contribute to household income, thus, increasing the likelihood of children dropping out of school. In the qualitative research, parents talked about sending some children to work in order to meet household needs and support the education of other siblings.

Household wealth

Household wealth is included in our regression as a proxy for a household's poverty status. The results indicated that children of wealthier households are less likely to drop out of school than their counterparts from poorer households. Disaggregated estimates also showed that the wealth effect is significant for both boys and girls and urban and rural children. Conversely, the dummy for debt was significant and positive, indicating a greater probability of a child from a credit-constrained household dropping out of school than their counterparts.

⁹ Similar result is obtained when we use birth order (see Table A3 in the Appendix).

In general, the qualitative findings were consistent with the quantitative results and support the “poverty hypothesis”. Economic constraints frequently emerged as an important barrier to school attainment. The impact of economic constraints is not always immediate but cumulative, and can eventually lead to children dropping out.

Similarly, seasonal demands for child labour have an impact on school attendance. This is especially true during harvest time when there is a considerable spike in dropouts, particularly among boys, that may be either temporary or permanent.

Dummies for land and animal ownership were found to have positive but insignificant effects on school dropouts in all Cox regression results, except for female-headed households and land ownership in rural areas. In other words, the effect of land ownership has significant and positive effects on children’s school dropout rates – but only for children from rural areas and from female-headed households where there is higher demand for child labour. This is linked to greater pressures on the household for labour to complete all necessary agricultural work.

The number of negative shocks experienced by a household was found to have a significant and negative effect on child dropouts, which appears counter intuitive. One possibility is that the occurrence of shocks is linked to the receipt of food or other types of aid. However, the qualitative research indicated that children had been forced to drop out of school as a coping mechanism in the face of frequent droughts and economic shocks.

Social capital

Social capital variables emerged as having a mixed effect on the duration of schooling in the regression analyses. While the impact of cognitive social capital (feelings of trust and belonging to one’s community) and structural social capital (membership of social organisations) were found to be insignificant overall, citizenship (involvement in collective action to address a social problem) was found to reduce the likelihood both overall and in urban sites of children dropping out of school.

Community and school factors

The regression results found that school proximity and the educational policy changes since 1996 have had a significant impact on school completion rates, while the qualitative results suggest that policy shifts in the SDPRP and ESDP II have also had an impact.

The probability of a child dropping out of school increases as the distance to the nearest private or public school increases. The risks of sexual assault and violence en route to school were also mentioned by a large number of respondents in the qualitative research as a key reason for withdrawing their daughters from school after the first primary cycle.

Turning to policy changes, a dummy variable for policy change revealed that children enrolled after 1996 are less likely to drop out than children enrolled before 1996. The same effect was found in separate estimates for boys and girls. The qualitative results confirmed this overall positive trend but because the research took place over two years later, it was able to reveal more of the impacts of policy changes since the second ESDP in 2002. In particular, the importance of affirmative action measures to increase girls' enrolment and work towards the Millennium Development Goal (MDG) 3 on gender equality and MDG 2 on universal education for all school children were highlighted, as were the effects of the community mobilisation efforts to increase school enrolment and stem dropouts. In other words, efforts to address gender equality in the education sector are not just a matter of political rhetoric, but have been translated into comparatively successful and innovative programmes at the grassroots level. The community empowerment and participation program encouraged parents to contribute money to buy school facilities.

5 Summary, Conclusions and Policy Implications

Our findings have important implications for the formulation and revising Ethiopian Poverty Reduction Strategy Paper.

While the policy focus of the 1996-initiated ESDP and the SDPRP (2002-5) on increasing educational access for all has been broadly successful, children from poor and/or highly

indebted families still face significant constraints because they have to contribute to household survival through paid and unpaid work. It is, therefore, imperative to increase efforts to improve the livelihood options of the poor, including greater income generation opportunities, particularly in rural areas and for women.

However, such strategies need to be child-sensitive. For instance, income-generating opportunities for women should simultaneously be accompanied by **community childcare systems** in order to prevent older children from shouldering their mother's childcare burden. If **credit programmes** are encouraging the purchase of livestock, community cattle-keeping mechanisms need to be encouraged to reduce pressures on children to drop out of school to attend to additional household livestock. Other policy solutions could include the introduction of targeted **conditional cash transfer programmes** that enable poor households to send their children to school by offsetting the costs involved.

Proposals to replace the **shift system** with a full-day school system need to take into account the demands of seasonal agriculture. Moreover, there is still much scope for **expanding the availability** of schools to poor and isolated communities.

Boys are already performing better than girls at the age of eight, suggesting that the current concern about girls' education is well-placed, and that existing programmes need to be evaluated, and then expanded or intensified. The SDPRP only explicitly mentions measures to address girls' low enrolment rates at the secondary, and not the primary, school level, and does not include any specific targets related to gender equity in its poverty reduction target indicators. It will be important for the second round of the SDPRP to incorporate gender-specific target indicators at all school levels. Given that girls' attendance was significantly influenced by safety concerns concerted measures are clearly needed to reduce their vulnerability in unsupervised public spaces. The widely reported positive impact on girls' education of the Family Law ban on early marriage and initiatives to tighten the implementation of the anti-sexual violence regulations suggest that these efforts should be continued and related laws rendered consistent.

Improving educational enrolment now will have a positive spill-over effect on subsequent generations. Adult education programmes should also be considered as

part of a comprehensive approach to achieving universal primary education for all by 2015.

The government and donors alike need to be cautious about romanticising the notion of “community empowerment and participation”, especially when it is often used as a euphemism for monetary contributions, and could lead to civic resentment towards education and increasing dropout rates over time. While communities may be able to subsidise the cost of new school infrastructure by contributing their labour and local materials, funds for purchasing books and other educational materials should be provided by government and donors.

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Table A1: Determinants of dropout (censored Cox regression) by rural/urban location

	(1)	(2)	(3)	(4)
	Hazard ratio for rural	Coefficient for rural	Hazard ratio for urban	Coefficient for urban
Dummy for Amhara region	0.611*** (3.06)	-0.492*** (3.06)	0.794 (1.01)	-0.230 (1.01)
Dummy for Oromia region	1.003 (0.03)	0.003 (0.03)	1.158 (0.97)	0.147 (0.97)
Dummy for Tigray region	0.677*** (3.03)	-0.391*** (3.03)		
Wealth index	0.405* (1.79)	-0.905* (1.79)	0.386*** (2.64)	- 0.952*** (2.64)
Male dummy (1 if male; 0 if female)	0.885** (2.19)	-0.122** (2.19)	0.803** (2.47)	-0.220** (2.47)
Age of child	1.006** (2.05)	0.006** (2.05)	1.064*** (5.91)	0.062*** (5.91)
HH size under 5 years old	1.094*** (2.77)	0.090*** (2.77)	1.394*** (5.97)	0.332*** (5.97)
HH size between the ages of 5 and 15 years	0.933*** (2.74)	-0.069*** (2.74)	0.898*** (2.73)	- 0.108*** (2.73)
HH size over the age of 15 years	0.866*** (5.56)	-0.144*** (5.56)	0.971 (1.06)	-0.030 (1.06)
Grades completed by the father	0.984 (1.36)	-0.016 (1.36)	0.950*** (4.02)	- 0.051*** (4.02)
Grades completed by the mother	0.961** (2.40)	-0.040** (2.40)	0.981 (1.49)	-0.020 (1.49)
Dummy for male HH head	0.946 (0.60)	-0.056 (0.60)	1.201 (1.50)	0.183 (1.50)
Number of events that decrease HH welfare	0.977 (1.57)	-0.023 (1.57)	0.996 (0.14)	-0.004 (0.14)
Cognitive social capital	1.007 (0.17)	0.007 (0.17)	1.024 (0.54)	0.024 (0.54)
Absolute structural social capital	1.076*** (3.03)	0.073*** (3.03)	0.862*** (3.16)	- 0.149*** (3.16)
Number of organisations from which one gets social support	0.983 (1.16)	-0.017 (1.16)	1.053* (1.71)	0.052* (1.71)
Citizenship	0.988 (0.35)	-0.012 (0.35)	0.854*** (2.67)	- 0.158*** (2.67)
Dummy for debt	1.186*** (3.04)	0.170*** (3.04)	1.242** (1.98)	0.217** (1.98)

Table A1 cont'd...

Dummy for HH owns or rents land	1.264*	0.234*	1.097	0.092
	(1.93)	(1.93)	(0.43)	(0.43)
Dummy for livestock ownership	1.089	0.085	0.999	-0.001
	(0.89)	(0.89)	(0.02)	(0.02)
Mean distance (km) to public and private primary schools	1.031*	0.030*	0.820***	-
	(1.71)	(1.71)	(3.42)	0.199***
Policy dummy: 1 if child was in school before 1997	0.125***	-2.078***	0.891	-0.115
	(28.13)	(28.13)	(0.89)	(0.89)
Dummy for SNNP region			0.986	-0.014
			(0.14)	(0.14)
	Observations = 1805		Observations = 1269	
	Wald Chi2 = 1414.65		Wald Chi2 = 242.91	
	Prob>Chi2 = 0.00		Prob>Chi2 = 0.00	

Robust z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Tassew Woldehanna: Children's educational completion rates and dropouts...

Table A2: Determinants of dropout (censored Cox regression) by male- and female-headed households (HHH)

	(1)	(2)	(3)	(4)
	Hazard ratio for Male HHH	Coefficient for Male HHH	Hazard ratio for female HHH	Coefficient for female HHH
Dummy for Amhara region	0.516*** (3.91)	-0.661*** (3.91)	0.675 (1.43)	-0.393 (1.43)
Dummy for Oromia region	0.937 (0.50)	-0.065 (0.50)	0.915 (0.37)	-0.089 (0.37)
Dummy for SNNP region	1.016 (0.14)	0.016 (0.14)	1.010 (0.05)	0.010 (0.05)
Dummy for Tigray region	0.595*** (3.44)	-0.518*** (3.44)	0.756 (1.11)	-0.280 (1.11)
Dummy for urban residence	0.814 (1.22)	-0.206 (1.22)	0.781 (1.12)	-0.247 (1.12)
Wealth index	0.774 (0.73)	-0.257 (0.73)	0.110*** (3.22)	-2.210*** (3.22)
Male dummy (1 if male; 0 if female)	0.861*** (2.72)	-0.150*** (2.72)	0.828 (1.46)	-0.189 (1.46)
Age of child	1.014*** (4.32)	0.014*** (4.32)	1.037*** (3.96)	0.037*** (3.96)
HH size under 5 years old	1.190*** (5.15)	0.174*** (5.15)	1.257** (2.56)	0.229** (2.56)
HH size between the ages of 5 and 15 years	0.892*** (4.69)	-0.115*** (4.69)	0.921 (1.41)	-0.082 (1.41)
HH size over the age of 15 years	0.884*** (5.09)	-0.123*** (5.09)	0.969 (0.70)	-0.032 (0.70)
Grades completed by the father	0.963*** (3.95)	-0.038*** (3.95)		
Grades completed by the mother	0.971** (2.52)	-0.030** (2.52)	0.965* (1.66)	-0.035* (1.66)
Number of events that decrease HH welfare	0.996 (0.24)	-0.004 (0.24)	0.916** (2.46)	-0.087** (2.46)
Cognitive social capital	0.984 (0.42)	-0.016 (0.42)	1.074 (0.96)	0.071 (0.96)
Absolute structural social capital	1.015 (0.58)	0.015 (0.58)	0.946 (0.91)	-0.055 (0.91)
Number of organisations from which one gets social support	1.010 (0.67)	0.009 (0.67)	1.004 (0.11)	0.004 (0.11)
Citizenship	0.942* (1.67)	-0.060* (1.67)	0.941 (0.80)	-0.061 (0.80)
Dummy for debt	1.135** (2.18)	0.127** (2.18)	1.325** (2.09)	0.281** (2.09)
Dummy for HH owns or rents land	1.140 (0.99)	0.131 (0.99)	1.363* (1.73)	0.310* (1.73)
Dummy for livestock ownership	1.051 (0.58)	0.050 (0.58)	1.221 (1.61)	0.200 (1.61)
Mean distance (km) to public and private primary schools	1.054*** (3.09)	0.052*** (3.09)	1.006 (0.15)	0.006 (0.15)
Policy dummy: 1 if child was in school before 1997	0.230*** (24.04)	-1.469*** (24.04)	0.436*** (5.82)	-0.831*** (5.82)
	Observations = 2512		Observations = 562	
	Wald Chi2(23) = 1269.37		Wald Chi2(23) = 266.97	
	Prob>Chi2 = 0.00		Prob>Chi2 = 0.00	

Robust z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table A3: Determinants of dropout (censored Cox regression) to see the effect of birth order

	(1)	(2)
	Hazard ratio	Coefficient
Dummy for Amhara region	0.600*** (3.65)	-0.511*** (3.65)
Dummy for Oromia region	1.016 (0.14)	0.015 (0.14)
Dummy for SNNP region	1.041 (0.40)	0.040 (0.40)
Dummy for Tigray region	0.708*** (2.72)	-0.345*** (2.72)
Dummy for urban residence	0.897 (0.79)	-0.109 (0.79)
Wealth index	0.407*** (2.81)	-0.900*** (2.81)
Male dummy (1 if male; 0 if female)	0.860*** (2.93)	-0.150*** (2.93)
Age of child	1.028*** (6.27)	0.027*** (6.27)
Birth order	0.914*** (3.11)	-0.090*** (3.11)
HH size under 5 years old	1.230*** (6.66)	0.207*** (6.66)
HH size between the ages of 5 and 15 years	0.950* (1.81)	-0.051* (1.81)
HH size over the age of 15 years	0.937*** (2.85)	-0.066*** (2.85)
Grades completed by the father	0.972*** (3.27)	-0.029*** (3.27)
Grades completed by the mother	0.971*** (2.98)	-0.030*** (2.98)
Dummy for male HH head	1.033 (0.40)	0.032 (0.40)
Number of events that decrease HH welfare	0.975* (1.89)	-0.026* (1.89)
Cognitive social capital	1.017 (0.52)	0.017 (0.52)
Absolute structural social capital	1.001 (0.05)	0.001 (0.05)
Number of organisations from which one gets social support	1.008 (0.62)	0.008 (0.62)
Citizenship	0.951 (1.56)	-0.050 (1.56)
Dummy for debt	1.173*** (2.98)	0.159*** (2.98)
Dummy for HH owns or rents land	1.159 (1.37)	0.148 (1.37)
Dummy for livestock ownership	1.064 (0.90)	0.062 (0.90)
Mean distance (km) to public and private primary schools	1.043*** (2.78)	0.042*** (2.78)
Policy dummy: 1 if child was in school before 1997	0.257*** (24.57)	-1.359*** (24.57)
Observations = 3074		
Wald Chi2(25) = 1382.47		
Prob>Chi2 = 0.00		

Robust z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

PERFORMANCE INDICATORS OF ICBE IN PRIVATE HIGHER EDUCATION AND HEALTH IN ADDIS ABEBA IN THE POST 1991 PERIOD¹

Tenkir Bongor, Gezahegn Ayele and Dejene Aredo²

Abstract³

This article is about institutional development around Investment Climate and the Business Environment [ICBE] in the establishment and growth of segments of the vital two social services - private higher education [PHE] and private health, in Addis Abeba, Ethiopia in the post 1991 period. ICBE encompasses aspects of institutions as they relate specifically to the start up, growth, development and performance or otherwise of businesses and their capacity to drive the pace of economic and social progress.

While the broad objective of the study has been to gauge progress in this arena and compare levels and directions of development, the specific objectives of the study was to develop parameters of performance indicators, gauge the on-going process as perceived by the market participants, derive issues for further fine tunings of ICBE, policy and serve as a baseline for further study.

¹ The final version of this article was submitted in November 2011.

² "One of the authors of this article, Dr. Dejene Aredo, Associate Professor of Economics at Addis Abeba University, passed away while this article was under review for publication. May his Soul Rest in Peace."

³ The writers wish to acknowledge Trust Africa, a Canadian research consortium based in Senegal which funded the main study through a competitive grant [one of 10 selected from a crop of 265 proposals from 30 African countries], Unity University for hosting the same and all the colleagues [11] especially Dr. Demmelash Habte [the Task Manager] and Ato Wondwossen Tefera [Data Collection and Processing Manager], who took part in the wider research project as authors, co-authors and enumerators. The Research Team would also like to acknowledge the adaptation of part of the questionnaires from the World Bank's ICBE study series.

To meet the objectives of shedding light on the on-going ICBE process, apart from desk research, the Data Collection Team interviewed 424 respondents including the managers and staff of private higher education [PHE] and private health service providers, the direct beneficiaries of the social services [employers, current students, graduate alumni and patients], the indirect beneficiaries [staff and parents] and the regulatory authorities [education and health bureaus of the City Government of Addis Abeba].

Partly as a result of improved ICBE, noticeable positive changes in governance, expansion in private higher education [PHE] and private health provision, efficiency gains, more effectiveness in the physical and social infrastructure are reported. Moreover, there are trends towards improved regional & gender equity, accountability in PHE and health delivery services, some levels of innovativeness and development and sustainability.

Notwithstanding these, the absolute quality and standard of education and health provision leave a lot to be desired. The noticeable achievements have been attained with some challenges which need to be addressed in the forthcoming fine tuning of ICBE improvement policies and institutional engineering.

Genuine and effective partnership between Government, the private sector and employers need to be remodeled with a certain level of autonomy for each. Government needs autonomy to ensure that its social goals are not entirely subsumed by the profit objectives of PHE and private health firms. The latter require autonomy to tailor their services in order to meet the specific demand of the market. The ultimate beneficiaries of the process, employers and students can enrich the institutional packaging through bringing in their up to date need in the state of the art and the content of education.

1. Introduction⁴

Since the collapse of the command economy and even before in some cases, there has been an increasing global trend towards the liberalization of economies including the social sectors. Ethiopia began to undertake such measures following the fall of the *Derg*⁵ in 1991. In the past seven years or so, the Ethiopian economy has been growing at an unprecedented rate of 10% per annum. Concurrently, both government and private sector growth especially in education and to a lesser extent in health sectors have been remarkable. While the factors accounting for the growth rates are many and their interactions complex, the better governance of the Investment Climate and the Business Environment [ICBE] and with it the mushrooming of the private sector in education and health must have had some contributory impact both in the quantitative scale and in driving the institutional momentum for growth and development.

This paper is about institutional development around Investment Climate and the Business Environment [ICBE] in the establishment and growth of segments of the vital two social services - private higher education [PHE] and private health, in Addis Abeba, Ethiopia in the post 1991 period⁶. ICBE encompasses aspects of institutions as they relate specifically to the start up, growth, development and performance or otherwise of businesses and their capacity to drive the pace of economic and social progress. Such studies on ICBE have been commissioned [2007] by Trust Africa, the sponsors of this study in ten nine African countries including Ethiopia. The broad objectives have been to gauge progress in this arena and compare levels and

⁴ The basic research and full reference for this article is found in the wider Trust Africa funded and Unity University hosted ICBE Research Report: **Investment Climate and the Business Environment [ICBE] in Private Higher Education [PHE] and Health Sectors in Addis Abeba [ETHIOPIA] in the Post-1991 Period.**

⁵ The military junta that ruled Ethiopia during 1974 -91.

⁶ To meet the objectives of shedding light on the on-going ICBE process, apart from desk research, the Data Collection Team interviewed 424 respondents including the managers and staff of private higher education [PHE] and private health service providers, the direct beneficiaries of the social services [employers, current students, graduate alumni and patients], the indirect beneficiaries [staff and parents] and the regulatory authorities [education and health bureaus of the City Government of Addis Abeba].

See Section two for details and the appendix for the list of the health and education institutions and employers of graduates from which data was collected.

directions of development.⁷

The ICBE study report in private higher education and health hereunder is a reflection of the ongoing interactions of the social forces unleashed by the Ethiopian People Revolutionary Democratic Front's [EPRDF] policy framework – private sector development and the state's leadership interacting with the embedded values of Ethiopian societies in implementation. While the private sector's and the state's operational *modes operandi* in the development of private higher education and health are explicitly dealt with, the federal system is purported to bring out the ownership and enhancement of development programmes in their respective areas⁸.

Among a myriad of social and cultural institutions, the business environment is enveloped by the formation, character and capability of the state to lead and/or promote the development process in conjunction with the private sector⁹. This is because of the fact that a capable state has the authority and capacity to create and modify institutions in order to define property rights and enforce contracts. The negotiated and/or contested social space between the private and public spheres represented by the state at a given time bring to the fore the opportunities and constraints in the working out of the ICBE. Constructing a working institutional and policy framework between the private and the public sectors and in the context of developing countries interfacing the two with the indigenous ones is a critical pre-requisite for successful transition towards growth and development. In this arena of discourse, *the relative role of the private sector and the state as drivers of the development process has been a contentious issue.*

⁷ The findings from the different countries are on website which were not available when this paper was drafted. Selected papers including this are slated to be published. The specific objectives of this paper are given under section two.

⁸ Since the study was undertaken in Addis Abeba, the capital and the melting pot of the nation, if at all operational, the local/indigenous institutional aspects in the process have only been implicit and not explicitly incorporated in the study proper.

⁹ The full research has several paragraphs as commentaries on the state and its changing role in the development process. A recent discourse in this realm is the concept of the "developmental state" [See chapter 2.7 of the Draft Research report by Dejene Aredo cited above.

Institutional economists classify institutions and their capacity to initiate, drive and sustain the development process at particular time in a given society into three interacting hierarchical levels – the social cultural foundation, the institutional environment or the “formal rules of the game” and institutions of governance or “the play of the game” [Clague: 1997; Dejene Aredo: 1999, 2009 in Tenkir Bonger (ed.) 2009a; Gibson *et al* 2001; Leftwich 1999; North 1991; Williamson 2000]. Applying this analytical scheme to Ethiopia, under the imperial regime of Haile Sellassie [1930-1974], Ethiopia was emerging from a fragmented traditional polity towards centralization under absolute monarchical rule with social norms dictated by religion and ages old tradition. Side by side, modern education, nascent industry and formal modern institutions in the form of civil service and the army were making significant inroads¹⁰.

This apparent reformist autocracy¹¹ was however interrupted by the coming to power of the military regime [1974-91]. The revolutionary transformation ushered in a period of uncertainty and instability arising from highly volatile institutional environment, wholesale expropriation of medium and large firms and the attendant outright limitation of property rights. During this period, there was very little formal control of neither power nor systems of checks and balances opening the way for excessive political rent-seeking behavior on the part of political leaders.

Unexpected and often changing regulations, unpredictable government interventions, lack of consistent enforcement of contracts and the absence of rule of law were the defining characteristics of the military regime. This institutional uncertainty led to undesirable behavior and attitude on the part of actual and potential economic agents including a retreat to personal transactions with private enforcement mechanisms, an almost entire dependence on social networks in lieu of markets, and a strong preferences for present consumption at the expense of intergenerational equity reinforcing the traditional saying “yenegewin egziabher yawkal” – that of tomorrow will be known by [only] God. The Ethiopian economy

¹⁰ Detailed exposition of the policy frameworks and the economic outturns of the different periods is found in Tenkir Bonger (ed), 2009a.

¹¹ These two seemingly contradicting elements of the *ancient regime* are deliberated on in some detail in the Draft Research Report, Tenkir Bonger 2009a, Chapter One, Section 4, “State and Economy in Ethiopia in the pre-1991 Period”.

experienced the lowest total and per capita growth rate. These outcomes were inimical for the emergence of ICBE to propel the economy towards reducing information and transaction costs, lowering uncertainty in human exchange, assisting individuals to make choices on the basis of their mental models - all of which are essential components of a conducive ICBE to drive the development process.

Given the above scenario, when the modern policy regimes of Ethiopia are taken together at the onset of the ICBE study period, the Ethiopian economy had traversed ideological swings, political and policy reversals and abrupt macro, meso and micro management system changes all of which did not augur well to drive it towards stability, sustained growth and productivity¹². The ICBE in the baseline period of this study has thus been overlaid on abruptly changing policy regimes.

This paper has seven parts. Following this Introduction, the next section outlines the Methodology and Sample Distribution. This is followed in sections three and four by the Formal Regulatory Frameworks [rules of the game] and the Broad Outcomes [play of the game] towards ICBE in the study period. The gist of the article in section five, ICBE Promotion Performance Indicators, are discussed under **governance, expansion of services, standard and quality, possible efficiency gain, regional and gender equity, accountability, effectiveness, innovativeness, development and sustainability**. Section Six outlines the main Emerging Issues and Challenges. Derived from some of ramifications of the operation of ICBE in the study period as reported on in sections five and six, the Way Forward in Section Seven concludes the paper raising issues calling for fine tuning of policy, institution building avenues and implementation modalities.¹³

¹² A 2002 survey by the World Bank (2007) showed very low labour productivity in Ethiopian firms partly accounted for by the poor ICBE. China's average wage was three times that of Ethiopia but China's labour productivity was nine times higher. The investment climate constraint is said to have accounted for about 16% of the low level of productivity.

¹³ Part of the explicit and implicit conclusions and recommendations emanate from the larger Draft Research Report cited under footnote number 6 and 7. The regulations and proclamations on which the discussion is based are listed in the reference.

2. Methodology and Sample Distribution

The broader context of the study in general and with respect to Ethiopia in particular has been set out under Section One. Within this broad framework, in one form or another, private sector development and political liberalization have been among important hallmarks of globalization in the last twenty years or so. The simplification of doing business partly via improved investment climate and business environment [ICBE] have been driven in many countries especially by the Bretton Wood institutions. Concurrently, many African countries have reversed economic stagnation and a good number are on the path towards growth and better macro-economic indicators [World Development Report: various recent years]. At least part of the reasons for improved economic performance have been attributed to reformed ICBE. This paper set out to assess the process and outturns of ICBE in Addis Abeba focusing on health and education along similar lines undertaken by the World Bank [World Bank 2002, 2006 and 2007] for example in Ethiopia [for manufacturing industries] and India. The main objectives of the study was to:

1. develop parameters of performance indicators¹⁴
2. gauge the on-going process as perceived by the market participants
3. derive issues for further fine tunings of ICBE and policy
4. serve as a baseline for further study

As this is an attempt towards the measurement of **institutional development**, the study carried out surveys among a cross section of the service providers [private higher education and health], the direct [alumni and current students] and indirect beneficiaries [employers and parents] of the services and the regulatory bodies. Unlike the public sector, the distinguishing characteristics of both sides in the transaction is that they are connected by the nexus of the market. To amplify any differences in their products, some indirect comparison of service provision by the market and the public sector were made.

Towards this end, the survey encompassed eleven categories of interviewees which can be broadly classified into five vis:

¹⁴ Listed under section six, these were derived from the general and specific objectives of socio-economic development informed by the literature.

- Private higher education [PHE] and health service **providers** [2]
- PHE & health service provider **staff** [2]
- Direct beneficiaries of services – **students, patients & alumni** [3]
- Indirect beneficiaries of services – **employers and parents** [2]
- Government **regulatory authorities** [2]
- Total [11]

Under private higher education, four separate assessments have been designed to collect data from the education firms, staff of the education service providers, students (direct beneficiaries) and their parents (indirect beneficiaries) of the education services. Similarly, under the private health institutions, three different surveys were structured to obtain information from private health firms and their staff and patients (direct beneficiaries). In the third targeted institutional category, employers of and the alumni themselves, the survey was designed to compare the outputs of graduates from PHEs with those from Government colleges. The survey also included education and health regulatory institutions which as per the scope of the study, was confined to offices of the respective Federal and Addis Ababa Regional Governments

A total of 424 sample size was selected using structured questionnaires. Although this was an institutional study, to meet the minimum criteria for statistical inference, a sample size of 30 was adopted for institutions, parents and employers. Instead of interviewing just one, two each of staff [education and health separately], students, patients and alumni were interviewed from among the respective institutions giving a total of 60 interviewees each in these four categories. Among regulatory authorities, one each of the Federal and Regional health and education authorities were interviewed.

From the total population of 467 [103 lower clinics, 146 medium clinics, 99 higher clinics, 94 special clinics and 25 hospitals] private health institutions, a stratified sample was selected for interview. Similar procedure was employed for PHE institutions. Given the limited time and the large number of employers, it was impractical to construct a full list of all firms that employed graduates of private higher education institutions. Instead, a random sample of 30 were selected from a

list of 100 firms that were commonly known to have employed graduates of private higher education institutions.

Accordingly, 30 samples and 15 reserves that approximate the above distribution were selected. The names of the actual 30 firms each from among the health PHE institutions that gave the required information through structured interview is attached in the Annex 1. The names of the 30 employer firms are listed in Annex 2. Once the institutions were selected in this way, the corresponding students, staff of the health and PHE institutions, parents and alumni were selected at a random from each organization. Patients were interviewed on the day of their show up at the health institution sampled. The breakdowns are shown in the table below.

The institutional responses to the outcomes of the ICBE collected using the above set of questionnaires from the PHE firms, their staff, customers, indirect beneficiaries and supervising government agencies were categorized under **governance, expansion, quality and standards, possible efficiency gains, effectiveness in the physical and social infrastructure, regional & gender equity, accountability in the service delivery process, indicators of innovativeness and development and sustainability.**

Table 1: Breakdown of the Total Sample Sizes

No	Targets of Questionnaire	Sample Size
1	Education Firms	30
2	Health Firms	30
3	Staff of Service Providers -Education	60
4	Staff of Service Providers - Health	60
5	Students	60
6	Patients	60
7	Alumni	60
8	Parents	30
9	Employers	30
10	Regulatory Authorities - Education	2
11	Regulatory Authority - Health	2
Total		424

3. The Formal Regulatory Frameworks [The Rule of the Game]

By privatizing a myriad of corporations previously owned by the state, the post 1991 Government of Ethiopia down sized the role of the state in economic activities and elevated the share of the private sector to enable it to operate within a market led economy¹⁵. This was a significant departure from the military regime's state-centered and centrally planned development policy.

The initial formal business climate change began following the Investment Proclamation No. 15/1992, which attempted to promote investment and lay a ground for private property. It encouraged investing domestic private capital in all sectors including in the production sector. Particularly after amendments in Proc. No. 7/1996, investments in private higher education and private health institutions have increased. The regulations grant different types of incentive packages for investment projects. It includes the education sector as one of promoted sectors and establishes eligibility for investment incentives in such areas as income tax exemption and duty free import of capital equipment.

By further amendment, in Regulation No. 36/1998, education is considered as a pioneer investment with more income tax incentive for general, secondary, technical, vocational and higher education. On their part, regional governments¹⁶ have also played significant role in promoting service sector in general and education by making available suitable plots of land with relatively fair lease price in order to attract the private sector. The consecutive investment codes of Ethiopian since 1991 show that the education sector is fully open to both local and foreign investors.

The main formal features for improving investment climate as enunciated in the Program for Accelerating Sustainable Development and Ending Poverty [PASDEP: 2005] include:

¹⁵ However, this process is incomplete as there are a number of governing political parties affiliated firms with unfair advantage over the strictly private firms in similar ventures which have to operate with the full economic, financial and political risks.

¹⁶ See paragraphs below on decentralization of power to regional governments.

- (i) continued simplification of business processes & licensing requirements
- (ii) strengthening of the regulatory framework and establishment of a level playing field through judicial strengthening, implementation of competition policy and enforcement of contracts.
- (iii) Financial sector reform to increase the availability of capital and working finance
- (iv) progressive withdrawal of state entities through privatization program and increased competition;
- (v) continued reforms to establish land tenure security
- (vi) maintaining macroeconomic stability and
- (vii) where appropriate, government provision of support to private sector in partnership and in some instances when a catalyst is needed to overcome initial barriers.

With specific reference to institution creation to facilitate dialogue, the Private the Public-Private Consultative Forum [PPF] was created with the Chambers of Commerce and Sector Associations. This serves the private sector as a venue to participate in reviewing and commenting on the government's strategies. The Consultative Forum involves owners from health and education sectors. It provides an opportunity for them to interact with Government & with each other.

With a population of nearly 80 million, the second largest in Africa after Nigeria, and diverse geographical and cultural entities, another important policy outcome of the post-liberalization period is the **decentralization** and consequent power devolution to lower level of administration. Unlike in the preceding decades of centralism, Ethiopian administration has shifted into a more proto type decentralized structure. Decentralization was operationalized with the establishment of regional governments in 1992. That Proclamation empowered regional states to have legislative, executive and judicial powers in respect of all matters within their geographical areas except in currency, foreign affairs, defence and inter-regional infrastructure, areas which have remained under the authority of the Federal Government.

In order to create a conducive environment for business among others, the Government has also carried out **Judicial and Legal Reforms**. According to PASDEP,

new laws are to be drafted and enacted in a number of key domains including revisions to civil and commercial laws. In addition, to provide better access to information on the justice system, a National Justice Information Centre is to be established. A consolidated Baseline Study Report covers all pertinent institutions of the justice system (federal and regional law making bodies, courts and police, prosecution service, higher education institutions providing legal training, and civil society organizations).

The PASDEP document discusses two major elements of the civil service reform process - staffing and incentives, and setting service standards for responsiveness to the public. They are being tackled under a medium-term **remuneration policy** at both Federal and Regional governments' levels. A **performance planning and management system, a human resource management policy and supporting rules and regulation** including job evaluation and grading, terms of service, and a civil-service-wide **HR management information system are being put in place. Gender-responsive recruitment mechanisms** and measures to make the working environment more women-friendly are expected to be instituted. To strengthen top management, a program of **annual management training** and bulk training of civil servants are targeted in the PASDEP.

To improve service delivery, in addition to the **Business Process Reform and Public Service Delivery Improvement Policy** already completed, **performance and service-delivery baselines** are expected to be established for (a) core government functions and (b) key services. These are to be publicized at the national, regional, and local levels. A **Public Servants' Code of Conduct** and supporting systems are currently under development. **The Public Service Delivery Improvement Policy (PSIP)** was adopted by the Council of Ministers in 2001. Most federal civil service reform offices have established **Customer Services and Complaints Handling** units and prepared service standards. The effectiveness and efficiency of all of these interventions remain to be evaluated by the targeted customers.

4. The Broad Outcomes [Play of the Game]

A full *ex poste* appraisal of the impact of the above regulatory and reform frameworks (play of the game) will need some more duration of implementation.

The following section provides only some general anecdotal review of their outcomes. The results of detailed interview based evaluations of ICBE and its outcomes from randomly selected PHE and health firms follow in sub-sections Four and Five below.

Five key federal Ministries (the Ministry of Finance and Economic Development [MoFED], Ministry of Trade and Industry [MOTI], the Ministry of Revenue, Ministry of Infrastructure, and Ministry of Agriculture and Rural Development [MoARD] together with their affiliated agencies have already undertaken service improvement measures resulting in the much reduced service time for licensing & customs clearances. The improvements are well observed in the operation of the Ethiopian Investment Agency for instance.

The decentralization process has devolved both legitimate power and fiscal decentralization at regional and down to *wereda*¹⁷ level. In this context, both the health and education sector services are decentralized. Moreover, National Action Plan (NAP) on gender, Citizens' Charters have been developed and publicized by all federal institutions during 2006-07. Minimum service standards at the *wereda* level, defining indicators, norms and standards are meant to strengthen the above efforts.

As a contribution to the dialogue, a consultative research forum led by one of the major private university colleges, Saint Marry, undertakes studies related to the features and the environments of the private education institutions [Alebachew Truneh: 2005; Ayenew Tessera: 2005; Ashcroft and Rayner:2004; Damtew Teferra: 2005; Messai Girma; 2007] . The studies presented in 2006 & 2007 focussed on quality of higher education, the role of PPP in promoting quality, the need for research in PHE institutions, national laws on Government incentive structure, government policies and institutional responsibilities, PHE institutions & Industry Relationship etc. These are meant to enhance the information and institutional capacities of PHEs.

¹⁷ The lowest decentralized administrative unit below zone. A number of zones make up a regional state.

There are however, other lines of communication between the private sector and the government. One way is through annual consultation workshop between the respective ministries and the private sector. The Ethiopian Chamber of Commerce and the Ministry of Trade and Industry meet in a formal meeting after the end of the fiscal year. There are similar forms of consultation in Ministry of Education [MoE] and Ministry of Health [MoH] focusing on issues like quality & accreditation for improving the development of the private sector. In addition to the formal dialogues, consultations with urban and rural citizens on diverse development issues have raised the public awareness of the importance of Public-Private dialogue for improving the investment climate.

The outcomes have also been reflected in the passing of the Trade Practices Act and the adoption of competition laws and regulations. An important supporting activity is sustaining the rule of law – strengthening the legal framework and contract enforcement so that businesses can have confidence in their dealings with other businesses and the safety of their investments. This is ongoing as part of the judicial reform and strengthening activities under the capacity-building initiative.

While the above are the general settings of the rules and play of the game for ICBE in the post 1991 period, the followings section offers more detailed performance measures of the ICBE improvement outcomes set in motion by the process in the post 1991 period in the realm of PHE and health.

5. ICBE Improvement Performance Indicators

5.1 Governance

One of the core areas for the assessment of investment climate is the relationship of government and business firms. Good economic governance in areas such as regulations, business licensing and taxation is a fundamental pillar for the creation of a favorable business environment. Effective regulations address market failures that inhibit productive investment and reconcile private and public interests through enhancing investment by providing various incentive schemes and by protecting firms from informal practices and unfair competition. The number of permits and approvals that businesses need to obtain, and the time taken to obtain them affects the level of investment and transaction cost. Moreover, unpredictability of policy

directions and inconsistency of regulations, lack of proper enforcement and negative perception about the tax environment may limit the operation and growth of the private sector.

Accordingly, first attempts were made to measure the ability and consistency of the government officials' interpretation of laws and regulations affecting private health institutions and how firms perceive this situation whether as constraint or opportunity for the operation of business. 70% of the respondents do not perceive the knowledge and consistency of government officials in interpreting laws and regulations as a constraint. 75% of survey results depict the familiarity of the private sector firms with government policies.

Another set of indicators focused on the relationship of private health firms with the government at Local, Regional and Federal Government level and the extent to which this relationship has been helpful in the smooth operation of their day-to-day business and creating a viable investment climate for private sector development. The survey result illustrates that in Ethiopia, governments at all levels have been found to be helpful in creating good business climate for private sector development¹⁸.

With such premises, 81%, 88%, 86% of the firms have indicated the helpfulness of the government at Local, Regional and Federal levels respectively. However, Federal Inland Authority, Customs Authority, Ethiopian Telecommunication Corporation, Ethiopian Electric Light and Power Corporation, Water Supply and Sewerage Authority are the first 5 Government organizations which are relatively inefficient in providing services required by private health institutions in Addis Ababa. On the other hand, tax rate, tax administration, license and permit, macro economic instability and corruption are the first five problems that are seen to have created minor obstacles for the growth and expansion of private health firms in Addis Ababa.

The majority of firms (75%) agree in most cases that they are familiar with

¹⁸ Some of the survey results in these respects may have to be taken with a pinch of salt as firms would consider that it is not in their best interest to criticize Government.

government policies, and they also participate in policy discussions directly or through their representatives at different levels (federal, regional and/or local) of government. **But the response about government regulations and enforcement predictability is inconclusive as half of firms said they were predictable in most cases and the other half said they were not.**

There are considerable number of firms that agree (52%) about the existence of informal gifts to government officials in order to make things done but its effect as obstacle is ranked as minor. The majority of firms identified that their relationship with government as helpful for their business, but when it comes to the different levels of government from federal to regional and then to local, the number of firms identifying the relationship as helpful decreases. This may lead to a suggestion that either problem solving decisions are still centralized or the service rendering capacity of regional and local governments are not sufficiently developed or they are not providing friendly services.

The majority of firms have identified the existence of all types of inspection in the typical year, 2006/7, except the tax office. Relatively, the visits identified for inspections seem more (84%) by quality and standard office of the Ministry of Education followed by Labor and Social Affairs (65%), the Federal Quality/Standard Agency (64%) and finally the Incomes Tax Office (47%). The reported senior managers' time spent in dealing with government regulations varies from none to 75%, but the average is 22% with significant variation in firm responses.¹⁹

Crime is also a key constraint in the governance investment climate. Crime increases transaction costs. Crime, theft and disorder are not only personal concerns but also of investors. Crime drives up the cost of doing business. This is because crime and disorder lead to loss in productivity and destruction of property. Only few firms in investment and business environment survey have indicated the existence of this as a major problem. Thus, street crime, theft and disorder are not found to be major problems in doing business in Ethiopia. As a result, the corresponding annual cost

¹⁹ According to Enterprise Survey Data [World Bank: 2006]. Generally in Ethiopia, business firms' management time spent in dealing with requirements of government regulations is 3.8 %. The result above shows that PHE and health institutions managers take far more time.

that went to finance security as percentage of total operating cost was low.

On the other hand, commercial disputes between firms and their clients occur in the course of doing business. When legal institutions are weak or non-existent, resolving these disputes can be challenging. However, few firms recognize the function of the judiciary system as constraints to their operation. According to the result of the survey, 43% of the health firms stated the existence of minor obstacle within the judicial system. The second set of indicator along this line is the direct costs of security incurred by firms as well as their direct losses due to crime, theft and disorder. These resources represent opportunity cost since they could have been invested in productive activities. Due to low rate of crime, theft and disorder, there was not much cost incurred by both education and health firms. The reported prevalence of default payment and loss as a result of theft, robbery, vandalism are low.

To evaluate the functioning of the judiciary system in general, four indicators, speed, fairness, impartiality and judicial system's cleanliness from corruption were used. In all the four cases, firms rank for fairness is greater than the other choices. The better indicator that is ranked as either agree or strongly agree by 85% of firms are the justice system's affordability and ability to enforce decisions.²⁰ The final four scale of measurement used to assess the functioning of the judiciary were their perceptions as no obstacle, minor obstacle, major obstacle and severe obstacle. 29.4% of the respondents stated that the judicial system was not an obstacle at all, and 70.6% of respondents identified them as of minor obstacle.

Crime and street conflict are minor or no obstacle in general. Those few firms involved used the formal justice system rather than the '*shimgilina*'²¹ to resolve their disputes. Eventhough their own experiences are limited, most agree that the level of the justice system's fairness, impartiality, quickness and affordability and

²⁰ Since our sample firms have had very limited experience related to court action, the evaluation is based on their general experience.

²¹ In Ethiopia, apart from the formal courts, there are other mechanisms of conflict resolution. One is '*Shimgilina*' whereby cases between the two parties will be handled by elders or individuals selected by both parties. No resort to this venue of conflict resolution was reported.

enforceability have not been obstacles for their business²².

With respect to governance at firm level, unlike the previously state run entities, at micro level, a new and diversified form of ownership and governance by nationals is emerging. While six of the surveyed firms are solely owned, the rest and the majorities are established in the form of partnership. Forty percent of the establishments' response shows that the firms are part of larger firm. The share of individuals and other businesses in the surveyed firms varied from ten percent up to eighty five percent, the average falling around fifty percent. In terms of classification of ownership by nationality, except one firm, all are registered as domestic firms, implying that the views and perceptions about investment climate and business environment presented in this paper represents mainly that of domestic firms.

Firms top management experience and level of education similarly shows variation from totally inexperienced managers to others with thirty years of experience in the field of education at an average of 8.6 years. The managers' level of educational qualification varies from first degree (20%) to Masters/PhD abroad (34%). From the sample taken, there are only four firms that have employed expatriate staff and even then at non-managerial level. Indigenous governance is the defining characteristic of PHEs and private health institutions.

In order to gauge the ease of operation of horizontal linkages between firms for self governance, firms were asked in which associations they were involved in and associated with. The result shows that almost all higher education firms (96%) identified themselves as members of professional associations but not in others. The three most identified services that firms expect from the associations are providing market information (25%), support for accreditation process (22%) and support on training and workshop (23%).

²² This mainly arises from their non-involvement. Case studies of those involved could have been a much better indicator along this line.

5.2 Expansion²³

Since private higher education and health firms trainees are fed by the public sector, the following paragraphs survey expansion in the public domain as a background to the PHE and private health institutions. In the age category of children 7-14 years [lower and higher primary in grades 1-8], in 2006, primary school total enrollment reached 12,657,342 (MoE: 2007) from a mere 2,466,464 in 1991 (World Bank: 2007). The primary gross enrollment ratio at national level became 86 %, with 79% for female and 92.9% male (MoE, 2007). When alternative basic education is included, the gross enrollment rate for primary reaches to 91% (99% for boys and 84% for girls). In the consecutive years from 2001/02 up to 2005/06, at national level, the average annual growth rate was 11.7%. Starting from far behind, primary enrollment rate is now approaching that of the level of the sub Saharan Africa regional average.

In 2006, the secondary school total enrollment reached 5,061,872 from 720,825 in 1992 (World Bank: 2007). The total gross enrollment rate rose to 37% by 2006 from only 13% in 1991. The female gross enrollment rate also rose to 28% in 2006. Implementing the Technical and Vocational Education Training (TVET) program, in 2005/06 at national level, the government TVET institutions reached 113 and non-government institutions increased to 156 (MoE: 2007). By 2006, the total actual enrolling capacities of both institutions were 123,557, including both regular and evening programs (MoE: 2007). The percentage share of vocational and technical enrollment from the total secondary enrollment increased from 0.18% in 1999 to 2.38% in 2006, (World Bank: 2007). The total secondary education teachers increased from 23,319 in 1991 to 95,590 in 2006, a nearly fourfold increase.

The high growth rate, absolute levels of attainment in enrollment rate in the pre-primary, primary and secondary levels have also been achieved at tertiary level too. In this case, a more than fivefold increase from 34,076 in 1991 to 191,165 in 2005 was achieved (World Bank: 2007). The non-governmental higher education institutions enrolment in 2005/06 was 39,691, which is a share of 22% from the total

²³ Most expansion has taken place in the state sector. But nearly ¼ of the newly constituted Technical and Vocational Education Training [TVET] programmes are in the private sector. The data for this section is heavily relies on the chapter by Demmelash Habte in Tenkir Bongor [ed] 2009a.

(MoE: 2007). The number of tertiary level teachers increased to 4,847 by 2005 from only 1,690 in 1991.

The average total enrollment of students in PHE per firm in the academic year of 2006/07 was found to be 1,590 with a standard deviation of 2,107 for degree and 1,328 for diploma students with a range from the minimum 24 up to maximum of 7,606 students. Similar to the size of the academic staff, the average enrollment in PHE is affected by few firms which have higher enrollment capacity. Those that had higher enrollment capacity in the period mentioned were Micro Link, an ICT firm (7,606), Admass College (6,283), St. Mary University College (5,217), and Unity University (4,355). The average enrolment per firm for each level was bachelor degree (971), diploma (858), and certificate (172). This indicates that bachelor program takes the larger number of enrollment per firm. There were distance education programs both in diploma and degree with average enrollments per firm of 36 and 283 respectively. Nationally, if the average of the last five years trend is maintained, there is a real prospect of reaching the MDG goal with respect to primary education even before 2015. If the current trend continues, gross enrollment at primary level will be 100% by 2010 (MDG Report: 2004:19).

5.3 Quality and Standards

The post-liberalization reform, particularly the one in 2003 established two autonomous public institutions. They are the Higher Education Relevance and Quality Control Agency (HERQA) and Higher Education Strategic Centre (HESC) which are expected to control quality through external audit, guidance and overseeing both public and private institutions. With regard to standards and quality, only 17% of PHE institutions said that they have services which are of internationally recognized quality and certification. This is however at variance with alumni, 41.1% of which claimed that their alma mater had internationally recognized quality certification

Despite significant increase in the provision of health services both by the public and private sectors, the progress achieved in health in terms of quality and quantity has been much slower. In the face of population size of about 80 million, in the year 2005/06, there were 5,955 health posts, 1,206 health stations, 635 health centers,

138 hospitals and 13,922 beds - about one hospital bed for over 5,390 people which is very low by any standard.

The majority of basic health indicators in the country show that the health status of the population in Ethiopia is worse than the average for Sub-Sahara African countries. Life expectancy at birth averaged only 48 years. Infant mortality rate (IMR) is 97 per 1,000 live birth, child mortality is 50 per 1,000 children (MoH: 2005/06), and maternal mortality ratio is 673 per 100,000 live births (CSA: 2005). Compared to education, achievements in terms of improving the coverage and quality of health services has been modest. Many of the rural health institutions are understaffed and lack appropriately trained and experienced manpower.

Within this macro scenario, private sector health firms could not attract enough patients. The obvious reason is the economic demand with patients looking for lower fees, inability of the private health institutions to meet the minimum standard and the problem of recognition as a medical establishment. Very few of the sampled firms have reported to have internationally recognized quality certification. Even though the service quality of private sector health institutions are better than equivalent government institutions, the absolute quality of their service leaves much to be desired²⁴.

Between 1992-2006, some 5.5 billion Birr worth projects were licensed by the Investment Authority for 432 projects in the health sector. Of this total capital intended for investment in the sector, only 32 % was in the implementation phase and even fewer [5.4 %] started services. In the same period, only 11 % with a capital share of 50 % of all the investments licensed in the health sector were owned fully or partially by foreigners. Both the quality and standard of private health and education leave much to be desired. Despite numerous attempts by the government to particularly encourage foreign investors, private foreign investment in Ethiopia is at a very low level.

²⁴ The only consistent proxy measurement of quality in the study was a comparative one between Government and PHE/private health institution by employers [for PHE graduates] and patients in which the private ones were reported to have been at par [2/3 of all respondents] with those of Government. Those who said that the private ones were better were significantly more than those who said that they were worse. The value of this is of course dependent on absolute measurement by professionals.

It appears that given the rapid speed of expansion especially in the education and to some extent in health is enveloped by limited resources at disposal, a mere drive towards achieving universal primary education, at higher education levels may come at the expense of quality of education [Damtew Tefera:2005; Ayenew Tessera : 2005; Ashcroft 2004] and health.

5.4 Efficiency Gain

Private sector development involves stimulating domestic enterprise creation, growth and attracting more foreign investment. Legitimate investment needs an enabling environment. Investors invest where they find profitable opportunities and try to avoid risks or at least minimize them. Thus, good investment climate is an important determinant of a country's success in raising investment levels but also for firms to grow and develop through competition.

Efficiency gains in the process are both internal when firms employ new technologies, adopt healthy competitive practices and external which are induced by ICBE improvement measures external to the firms emanating from Government and/or global practices. When competition results in reduced costs [mostly transaction ones such as time spent in acquiring licenses and other services], its obverse is increased productivity, and gains from competition accruing both the consumers and suppliers of the services.

In this regard, with respect to the external efficiency gains, sample-licensed projects from manufacturing, construction and service sectors found that the average license approval time of projects over the period 1994-2003 showed a falling trend. The average number of days it took to get investment license in 1995 and 1997 were 41 and 22.8 respectively. This time drop shows that the Ethiopian Investment Commission has improved the efficiency of offering licenses.

The 2002 Ethiopian Investment Climate Survey by the World Bank showed tax rate, tax administration, access to land, electricity, corruption and regulatory policy uncertainty (in decreasing order) were the first five major constraints. A similar

survey of 2006, which covered 600 firms⁴, showed that there was improvement in investment climate in Ethiopia, compared to what it was in 2002 (World Bank: 2007). The study confirmed that improved conditions prevailed in business registration and licensing, customs clearance, telecommunication services and labour regulations. The update also signaled concerns in areas such as access to land, the firms' perceptions of the overall tax regime, access to credit; and utilities.

Taking successful competitive attraction of teachers and students by the private firms as a proxy for efficiency gains, firms reported to consider a variety of possible options including rumors, lowering fees, increasing salaries and/or manipulating prices and improving services. Though two or more of the methods are exercised by most of the firms, the dominant mechanisms are rumors (63%)²⁵ and lowering prices (59%). Run by bureaucrats, whereas fee charging public institutions take time to respond to conditions of demand and supply, private sector health and education firms appear to increase the producer and consumer surpluses by responding to prices more rapidly.

Education firms enrollment fee is also considered to show the degree of competition. It gives a signal for the existence of competition especially in the bachelor and diploma programs both in day and evening offers. There is large variation between per credit hour cost, ranging from 40 (35) to 120 (400) for bachelor degree by day (evening) and from 35 (35) to 300 (260) for diploma day (evening) programs. This may be partly explained by the nature and type of the course and partly as a mechanism of dislocating other competitors from the market. In order to reduce cost, firms reported to economize on one or more of the inputs: academic staff time, class room and teaching materials.

The other indicator for the efficiency of firms to increase service quality and productivity is capacity utilization. For the majority of firms in the health sector (86%) capacity utilization is 75% and above, but there are also 11% of firms whose

⁴ Included 360 manufacturing, 125 services and 115 informal sector firms taken from six major urban centres of six regions, including Addis Abeba and Dire Dawa.

²⁵ Nonetheless, according to the result of the survey, these practices have only created minor obstacle to the smooth business operation of most other firms who reported to not practice them.

capacity utilization is less than 50%. The main reasons that these firms mentioned for the underutilization of capacity is mainly lack of demand and working capital. Although they are operating at below capacity owing to various reasons, it can be inferred that private health sector firms in Ethiopia are more efficient than their counterparts in government institutions. The underlying reasons for the private sector firms efficiency is the economic use of the available resource that can be expressed in terms of operational space, staff time and materials mainly related to overhead costs. Competition and efficiency also prevail when private firms share the markets of those who had the dominant monopolist supplier position.

5.5 Gender and Regional Equity²⁶

Given that a bulk of the GDP originates from Addis Abeba, most PHE and health service firms are also located in the capital city. Patriarchy and early marriage is in the social fabric of most communities in Ethiopia which has been contributing towards a lower participation rate for the girl child. Even when some improvements in enrolments are made at lower levels of education, high dropout rates following early marriage by young girls opens up the sex disparity in educational attainments. Limiting the minimum age of marriage and concerted awareness efforts by Government and rural communities has somewhat narrowed the gender gap, but differences still prevail.

The regional distribution of primary gross enrollment of 2005/06 is markedly disproportionate, with the highest in Addis Ababa (148%) and least is the Afar region at (21.9%). Ratio of female to male net enrollment in primary, secondary and tertiary are 0.89, 0.61 and 0.35 respectively. In spite of this, the PHE institutions have played significant role by creating access to high proportion of women students. More females in health and education by distance, evening and adult education has produced a better spread of educational attainment by age group giving adults a second chance in education. **There is now more parity between the sexes both in admission and alumni in the private sector but not yet among teaching staff showing the backlog of gender gap** and perhaps also of females

²⁶ Since private goods and services are offered on the bases of the ability to pay, level of equity on social grounds is not dealt with.

preference and better capacity to access employment in non-teaching jobs in the economy.

While 20 of the privately owned hospitals are found in Addis Ababa, in regions like Afar, Somali, Benshangul-gumuz, Gambela and Harari, there are none. The distribution of private health facilities is skewed towards the urban areas. The growing size and scope of the private health sector, both for profit and not-for-profit, offers an opportunity to enhance the health service coverage through such measures as subsidy and more focus by government towards the rural areas.

Despite the clearly stated objective of the government to undo regional imbalance in economic growth, new private investment is still attracted to areas where sufficient infrastructure is available and the demand for goods and services is more concentrated. These issues apparently figure more in investors' decisions about where to locate their projects than tax and other incentives (for example easy access to land) that regional governments provide to new investors compared to the incentives provided in Addis Ababa. Disparity in spatial location is evidenced in both approved and operational investment projects. More than 89 % of the licenses issued are for domestic investment projects intended to be located in Addis Ababa. With regards to operational projects, of those operational domestic investment projects in the health sector 29 % and 27 % are found in Addis Ababa and Amhara region respectively. Out of the total 9 operational foreign projects, 7 of them [78 %] are located in Addis Ababa.

Unlike in education, the prevailing inequality in health services does not seem to augur well for the attainment of MDGs. A lot of effort and resources will be required to accelerate the current slow progress to attain the MDGs. Although infant and child mortality rates have been declining over the last five years, the rates still remain very high. At the current slow rate of decline, attaining the child survival Millennium Development Goals (MDGs) will be quite challenging. The private sector's contribution in this regard is far from adequate. With profit motive as the motive of excellence of private investment, public policy need to ameliorate the shortfall in the provision of health and education services.

5.6 Accountability

Perhaps the most important finding which emerges from the study is the higher level of accountability by PHE graduates compared to those from Government higher education institutions as consistently attested by employers. This is critical in the realm of governance, service delivery and performance at work.

None of the employers rated PHE graduates as 'worse' than those of government in terms of the very important attributes of consciousness about rights, obligations, friendliness and cooperativeness. As many as 39% and 38% of the employers rated PHE graduates as 'better' than public sector graduates with respect to cooperativeness and friendliness. When the proportion of those respondents who rated the PHE institution graduates as 'worse' [which were in all cases less than 10%] are deducted from those who rated them as 'better', the net gains are 33%, 30%, 26% and 25% for self improvement, flexibility, willingness to take more responsibility and punctuality respectively. There was no statistically significant difference between the responses of employers and alumni in this regard.

The source for such better outcomes can be ascribed to the fact that given PHE students and patients are fee payers, they are conferred with more rights to seek accountability from the service providers in terms of both the provision of the services and the creation of a better social environment to attract more client students. Value for their money is embodied in their receipt of the services which they in turn appear to pass on upon employment [the graduates] and to their patients [health institutions]. The current alumni of the PHE institutions had to simultaneously meet the academic standards on their part and unfettered payment of their fees resulting in the recognition to demand rights in conjunction with responsibility which may have been taken to the world of work. **In order to attain a higher rate return for investment in education, public providers may need to take some cues from the modalities of the PHE institutions**

5.7 Effectiveness

A strong infrastructure enhances the competitiveness of an economy and makes a business environment more effective for firm establishment, growth and

development. Good infrastructure efficiently connects firms to their customers and suppliers and enables the use of modern technologies. On the contrary, deficiencies in infrastructure create barriers to productive opportunities and increase costs for firms. Both the physical and social infrastructure consideration include the state of land access & ownership, power, water supply and communication services particularly e-mail and web.

Access to plot of land is a major obstacle to education firms. Only 10% of firms from the total respondents fully owned their establishment, while the other 13% own partly and the majority of firms provide their services by renting buildings. By their very nature, private education in general and higher education in particular are businesses which have a long payback period especially if the objective of private firms includes serving the community. When most firms work on rental bases, it leads to the question whether the businesses are just at their infant stage, their targets are the short term benefit that arises from the accumulated backlog demand or whether there exists obstacle in accessing investment capital on land. The sizeable number of respondents ranked land availability as a major obstacle (44%) and very severe obstacle (26%).

The next set of government services related to making businesses effective are the provision of different services which are essential for running businesses. These services affect their efficiency directly and competitiveness. The services²⁷ include supply and repair of telephone, electricity, water, and different licensing and permit service providers. Firms were asked to give information about the waiting periods they take in order to get such services and evaluate the services in general based on their experience. According to the responses, the average waiting period in days for the three utility services are telephone repair (6.5), electric connection (5.4), and water connection (9.3). But the waiting periods for construction permit, operating license from MoTI and operating license from MoE are 21, 29 and 68 days respectively.

²⁷ FIRA = Federal Inland Revenue Authority
EEPCO = Ethiopian Electric & Power Authority
MoTI = Ministry of Trade and Industry
CenGov = Central Government

ETC = Ethiopian Telecommunication
WSSA = Water & Sewage Authority
MoE = Ministry of Education

The service that takes the highest average waiting period is to obtaining operating license from MoE. In order to see the operational efficiency and honesty of public service agencies including the central government, seven public institutions were evaluated by higher education firms based on four scale ordinal variables: very good, good, bad and very bad. The result shows that, all the institution's efficiency and honesty is ranked on average [33%] as very good and 57% as good which implies that 90% of the education firms are satisfied by the operational efficiency and honesty of these listed public services including the central government. Some of the firms which expressed satisfaction on operational efficiency and honesty also know the existence of informal gifts in order to get things done. If so, they may consider such informal gift as grease to smoothen the bureaucracy and increase efficiency.

In a scale of no obstacle, minor, major and severe obstacles, tax rates, tax administration, licensing and permit, macroeconomic stability, corruption, uncertainty, political stability, were identified as only minor obstacles. Among the obstacles, the three relatively major ones are unpredictability of policies (20%), and tax rate and corruption at 19% each. The three least identified as obstacle which can be considered as opportunity are licensing and permit (29%), political stability (28%) and macroeconomic stability (26%).

Since the majority of firms are not backed up by generators, they identified the existence of power interruption as a major obstacle., They also reported significant water disruption at least two times per month. In the consideration of electricity, transportation, water supply and communication taken separately as obstacles, electricity supply is relatively the major obstacle and communication is the least. Thus, taking the average of the four as potential obstacles in infrastructure, the reported negative effect in business is minor.

Transport is comparatively a moderate obstacle for the majority of all groups except patients, who visit health centres near their homes. However, the majority percentage of parents rank it as major obstacle. Telecommunication infrastructure is a minor obstacle for the majority of all groups, but few, less than 17%, consider it as major obstacle. Water supply is considered as moderate obstacle for the three groups, but the majority of staff consider it as minor problem. The study conducted

being for firms in Addis, the infrastructural constraints appear to be minor. E-mail is widely used in business but not the web. Another indicator for the existence of favorable infrastructure for education is the availability of recreational and sport facilities. A wide range of facilities like football, volley ball, basket ball etc. were considered. The aggregate response of the groups shows that 50.6% of respondents reported that there are one or more of sport and/or recreational facilities. Given the premium on space, outdoors facilities are far less than in door ones.

Regarding the effectiveness of the ICBE improvement measures in the provision of health services, close to one-fifth of the total population (18 %) who had health problem and sought medical assistance reported that the service was too expensive to consult. Problem of long waiting time is reported by 18% followed by about 16% that reported the unavailability of drugs, and 14% reported lack of laboratory facilities in the health institutions. Among the survey population, 22% reported shortage of personnel & medical equipment.

Although there is not as such a major problem in obtaining electricity connection in Addis Ababa, the results of investment climate survey in the private health sub-sector in Addis Ababa indicates that 77% of the firms reported to have experienced power outage ranging from 1 day to 111 days.

As a result, 70% of the firms were forced to own or share a generator with its all attendant impact on their operational performance and profitability. Likewise, the source of water being from public sources, 87% of the firms reported to have faced an average disruption of water supply for 15 days. The finding of the survey reveals that 97% and 30% of the firms have indicated the existence of respectively electricity and telecommunication infrastructure problems posing obstacles in their operation respectively.

5.8 Innovativeness

Entrepreneurs are more creative, innovative and risk taking people/firms in their businesses and therefore they are supposed to perform better, faster and cheaper. Their creativity and effectiveness enable them to manage uncertainties and become successful. However, like in public institutions, the main value of PHE firms is the

usual teaching which on average makes up 90% of the value of their output. 60% respondent firms reported to have been engaged in research taking 7% share of their total services. Thirteen firms reported to have been engaged in consultancy services that making up 5% of the value of their services. There are also around 50% respondent firms that have engaged in publishing services which amounted on average to 4% of their total services.

Unlike in the past, local text books and business profiles are being published by scholars in the country. Compared to government colleges, these may be considered as new shoots from traditional offers of higher education.

Several institutions are also participating in various extracurricular activities such as annual higher institutions sport, greening and beatifying the city, providing scholarships, sponsoring social duties and national programs in television and radio entertainments and shows. Private investors in education and health and among the fast expanding throughout the country and now they are crossing international borders and serve Ethiopians abroad through distance education. Private higher institutions are the one which started entrepreneurship as a common course in all their programs indicating their pro activeness to come up with new solutions for life other than being employees. The entrepreneurship seed is now being planted in Ethiopia through radios, televisions, newspapers and others thanks to the initiatives first under taken by private higher institutions.

There is a new generation joining the business community especially amongst the graduates of the private colleges as compared to those who graduated from public institutions. Entrepreneurial private business owners in education and health enterprises of Ethiopia are not only creating wealth for themselves, but also producing new breeds of entrepreneurs for Ethiopia. They are becoming seed beds of new entrepreneurial blood in the country. Yet, 85% of new entrants said that they did not introduce new practices, which means that these new comer firms employ the same practice that other old education firms use. But the source of entrepreneurship is not always visible and apparent. To the question whether they have plans to introduce new practices for the coming period, 43% reported yes.

5.9 Development and Sustainability

73%, PHE institutions and private health service providers which emerged as self improvement programs starting from very low base of capital and employment. Some private hospitals are now bigger than government ones and include training of health personnel and consultancy treatment. The top four PHE institutions enroll tens of thousands of students including offerings at post-graduate levels. Almost half percentage of the valid respondent firms have conducted curriculum design, teaching material improvement programs and have also plan to work with foreign partner in order to introduce new practices. On the rest of improvement programs, on average, 30% of respondents claimed to have had improvement programs for sustainability.

About 80% say that they have plans of one or more type related to pay, space, equipment and social environment. The result shows that it is improvement for better equipment and more pay/return that are cited more by the majority of staff, students and firms. For employers and parents, improving social environment is the major future target area for improvement. There are also considerable number of firms' responses (48%) who aim to work with foreign partners in order to introduce new products. In the last three years, 37% (11) firms reported new method of teaching or programs. Almost all firms' expectation for the coming one year is either increase the service capacity (75%) or maintain the current level (21%). This implies that firms expect that there is still potential demand that can be attracted.

Although there is no apparent trend regarding the increase in number of health firms in Addis Ababa, certain growth has been observed between 1999 and 2007 due to the relative macro-economic stability and the encouraging policy measures taken by GoE. For the study period, private health institutions in Addis Ababa have registered an average growth rate of 5%. However, the growth and operation of these firms is not up to the expectation. This is because the growth in number has not been accompanied by internal growth and development of the firms.

About 1/3 of the parents have obtained at least a first degree. Diploma, BA and Masters degree holder parent respondents are 28%, 24% and 8% respectively. 32% of the parents have a first degree or above going up to 60% when the Diploma

holders are included. This is quite high given the low level of education in the country in that generatio. Since most students come from educated families, they benefit from academic and social tuitions boding well for the sustainability and development of the PHE sector. .

6. Emerging Issues and Institutional Challenges

In order to see the existing opportunity and constraints for investing and doing business in PHE and private health in Addis Abeba, eighteen indicators that are related to the smooth functioning or otherwise of businesses were listed. These are electricity, transportation, access to land, tax rates, tax administration, customs and trade regulations, education of work force, labour regulations, licensing and permits, access to financing [availability and need for collateral], cost of financing [interest rates fees etc], macro-economic stability, political instability, corruption, street crime and disorder, practices of competitors, the functioning of the judiciary and Other: specify. The interviewees [firms, staff and employers] ²⁸ were then asked to identify those three deemed to be the most and least obstacles to their businesses on the one hand and those which have resulted in the three most and least benefits to the firms on the other.

Access to land, electricity, access to finance and corruption and possible political stability are mentioned as the top obstacles. According to staff, the three least benefits from the reform are with regard to corruption, transportation, access to land & practice of competitors. This result is consistent with the firm responses. Staff response has brought in to picture corruption as one big problem and as the least benefit from reforms. The employers of graduates cited electricity, the practice of competitors, access to land, tax rates and macroeconomic instability as the major problems. They also said that the least benefit from the reforms are related to transportation, corruption, electricity and the functioning of the judiciary.

Regarding the opportunities (benefits from reform) education business firms

²⁸ Firms refer to private higher education establishments whereas employers are those business firms that hire graduates from higher education establishments both from government and private.

identified the following as top three - macro-economic and political stability, licensing and permits and access to finance. Staff response for the top three benefits from the reform are electricity, access to land and political stability. According to them, the least three problems which are considered as opportunities are practice of competitors, electricity, street crime and disorder with equal weight for labor and regulation. **It is only among education firms that licensing and permit is one the top five problems.** This may be for the reason that getting license from MoE takes longer. Access to finance and macro economic stability are viewed as problems by education firms and staff but not by employers. The big problem unique to employers that is not identified among the top five in other cases is competitors' practices. Both staff and employers consider transport and corruption among five big problems which is not identified in the top five's by education firms.

All the three groups similarly recognized that the reform regarding licensing and permit, land access, electricity and macro economic stability as well as political stability have brought benefit to businesses. The paradox here is that except macro economic and political stability, the aforementioned areas especially electricity, access to land and finance also remain as major problem areas though to some extent benefit is obtained from the undergoing reform. Firms and employers also perceive that there is benefit related to access to finance.

Private businesses need an institutional structure that allows them to collectively voice views on policy, programs and institutional reform for delivery of efficient services. There is a dearth of evidence to indicate whether or not the PPP forum of the education and health private sector has had sufficient dialogues. The challenge is to invigorate them when as now developmental institutions are weak, nonexistent, or not oriented towards improvements. The institutions facilitating these kinds of forum can be the MoE and MoH. Yet, unlike in education, a body coordinating the private health has not been yet established.

The existing institutional facilities, whether in regulatory or supporting role are predominantly public. MoE and MoH are structured in such a way that they accommodate the roles expected of them in regulating and supporting both private and public service rendering institutions. Such Departments could have been too engaged in public institutions to undertake their required roles in the equivalent

private sectors. **As a result, unlike other private sector engagement such as manufacturing, the private health and education sectors have had less interactions with the government, among themselves and with society.** There is no established viable partnership with sister colleges at home as well as with the business enterprises and the local community. However, the recent move to establish Association of Private Health Institutions is a positive development. A lesson can be learned from the experience of the manufacturing and other service sectors that demonstrate the positive role of associations as significant steps towards the attainment of PPP objectives.

In anticipation of the increasing role of the private sector in health, Federal MoH has assigned the development of Private-Public Partnership to the Service Department. **On the ground, however, there is very little opportunity for private sector participation in the policy dialogue. Indeed, the private sector in health (both for-profit and not-for-profit) needs to become involved more actively.**

7. The Way Forward

7.1 The Broad Economic Outturn

Driven by the restructuring world economy with massive incremental output and demand in the BRIC [Brazil, Russia, China and India] countries in particular, the Ethiopian economy has been experiencing a remarkable growth rate of over 10% on the average in the last seven years. The growth rate in the post 1991 period as a whole has been significantly higher. This is the more interesting because it is posited on a small holder based agriculture without much of, albeit the 'curse, of minerals' such as in Angola and Nigeria. To take advantage of this global change, the Government of Ethiopia [GoE] has been taking several institutional and policy reforms spelt out in different part of this paper. With respect to PHE and health, the policy reforms appear to be bearing fruit as expressed in the expansion figures and the responses of service provider firms on different measures of aspects of ICBE.

7.2 Institutional Policy Fine Tuning

Notwithstanding the above, there are several areas which require fine tuning of policy and institutional reforms.

7.2.1 Privately educated employees are more conscious of both their rights and obligation. Since fees have to be paid, with the right to choose and ensuing demand for better services, the more rights and obligations consciousness is perhaps a carry-over of more accountability practiced in PHE colleges. This implies more effectiveness and efficiency in service delivery in the PHEs. Government may have to take some cues in studying and implementing a policy modality of making **public funded institutions to be accountable and transparent to their students and tax payers.**

7.2.2 Given the still low level of the economy, tremendous growth in private health and education may have proceeded at the expense of quality. Using selected measures, this study compared the quality of delivery between the private and the public institutions which is only **relative**. There is a need to use **absolute dimensional benchmark** to compare and monitor quality.

7.2.3 What emerges from this study is that the check on quality and standard appear to be very weak. There is a need to **classify and ascertain minimum standards**, not just for levels such as lower, medium and higher clinics, hospitals, primary, secondary schools etc. but also **grades within so that service buyers can make informed choices for given resources at their disposal.**

7.2.4 The partnership between PHE and private health institutions on the one hand and the government on the other does not appear to be sufficient and effective. Similarly, the **partnership between PHE institutions and employer agencies seems to be weak and this can hamper further investment in education sector unless noticeably competent institutions are in place providing such services.**

7.2.5 Unlike in the manufacturing sector firm associations, there has hardly been a dialogue **between the government and the private education and health sectors**. Except the already existing public supporting institutions that facilitate service delivery by both public and private institutions, there is a need for **the emergence of new innovative and supporting institution.**

7.2.6 Improving the quality of education at all levels and **strengthening the public – private partnership in the field of private health and education** are the main areas of challenge that all stakeholders must consider and accordingly deal with in the future.

7.2.7 Among education firms, **obtaining licensing and permit is still a major roblem which needs to be looked into as soon as possible.**

7.2.8 The response about government regulations and enforcement predictability is inconclusive as half of firms said they were predictable in most cases and the other half said they were not. This is a cumulative expression of the quality of the services which requires the immediate attention of those concerned.

7.2.9 The growing size and scope of the private health sector, both for profit and not-for-profit, offers an opportunity to enhance the health service coverage through such measures as **subsidy and more focus by government towards the rural areas.**

7.3 Broader Policy Issue

Rather than absorbing the left over from the Government sector, genuine and effective partnership between Government, the private sector and employers need to be re-modeled with a certain level of autonomy for each. Government needs autonomy to ensure that its social goals are not subsumed by the profit objectives of PHE firms. The latter require autonomy to tailor their services in order to meet the specific demand of the market. The ultimate beneficiaries of the process, employers, patients and students can enrich the institutional packaging through bringing in their up to date need in the state of the art and the content of service delivery.

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Annex 1: Private Health and PHE Firms Interviewed

No.	<u>Name of Health Firms Interviewed</u>		<u>Name of PHE Firms Interviewed</u>
1	Abinet Clinic	1	Addis Ababa Polytechnique College
2	American Ghibi Clinic	2	Admas University College
3	Arat Kilo Clinic	3	Africa Health College
4	Arsho Laboratory	4	Atronus College
5	Asegedech Mother and Children Hospital	5	Ayer Tena Health Science College
6	Awash Dental Clinic	6	City University College
7	Aynalem Clinic	7	CPU College
8	Blue Nile Clinic	8	Dynamic International College
9	CMC Michael Clinic	9	Ethiopia Distance Education College
10	Connel Clinic	10	Hayat Medical College
11	Dashen Clinic	11	HilCoe Computer Science College
12	Dr. Akalewold Special Dental Clinic	12	Infonet College
13	Dr. Yeshihareg Dental Clinic	13	Keamed Medical College
14	Eldina Clinic	14	Kunuz College
15	Empire Clinic	15	Micro link IT College
16	Entoto Godana Clinic	16	Miracle Health College
17	Genet General Hospital	17	National College
18	Kidist Mariam Clinic	18	New Abyssinia University College
19	Luck Clinic	19	New Generation University College
20	Master Dental Clinic	20	Nolicom College
21	Megenagna Clinic	21	Orbit Information Technology College
22	Raey Clinic	22	Roha College
23	Selam Teklehaimanot Clinic	23	Royal University College
24	Sengater Clinic	24	St. Marry University College
25	Seyoum Special Eye Clinic	25	Tropical College of Medicine
26	St. Michael Clinic	26	Unity University
27	Tensae Clinic	27	Universal Medical College
28	Tesfa Kokeb Clinic	28	Yanet Health Science College
29	Tezena General Hospital	29	Yardstick Distance Education College
30	Toneam Dental Clinic	30	Yenegew Sew University College

Annex 2: Interviewed Employer Organizations

- 1 AB Plast PLC
- 2 Abyssinia Bank S.C
- 3 ACOMEX PLC
- 4 Addis M.F
- 5 ADS Pharma
- 6 Africa Insurance S.C
- 7 Africa Printing Press
- 8 Alliance Flowers PLC
- 9 Ambassador Textile and Garment PLC
- 10 ASA PLC
- 11 Awash International Bank
- 12 Chamber Printing Press
- 13 Comet Trading PLC
- 14 Commercial Bank of Ethiopia
- 15 Dream Flowers PLC
- 16 Ethiopian Insurance Corporation
- 17 Ethiopian Telecommunication Corporation
- 18 Finfine Furniture Factory
- 19 Global Insurance S.C
- 20 Jupiter Trading
- 21 Lion International Bank
- 22 Meweda Academy
- 23 Myungsung Christian Medical Center
- 24 NAS Foods PLC
- 25 Nib International Bank S.C
- 26 Nile Insurance S.C
- 27 Raselase Diversity School
- 28 SNAP Computers
- 29 United Bank S.C
- 30 Wogagen Bank S.C

ESTIMATION OF FARM LEVEL TECHNICAL EFFICIENCY AND ITS DETERMINANTS AMONG MALE AND FEMALE SWEET POTATO FARMERS IN IMO STATE, NIGERIA¹

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Abstract

With the difficulties encountered by the farmers in adopting improved technologies, increasing resource use efficiency has become a very significant factor in increasing productivity. Therefore, this study was designed to estimate the farm level technical efficiency and its determinants among male and female sweet potato farmers. Primary data collected from a random sample of 120 sweet potato farmers (64 females and 56 males) were subjected to production function analysis. The result showed that fertilizer and farm size positively affected output for both farmer groups. Labour and capital positively affected output for the females while quantity of sweet potato vine affected the output of the male farmers positively. The mean technical efficiency for the female farmers was higher (92%) than that of their male (85%) counterparts. Farming experience and access to credit were positive and significantly related to technical efficiency for both farmer groups, while no significant relationship was found between technical efficiency and level of education, co-operative membership and age for both farmer groups. Therefore, policies for improving farmers' access to credit, land and extension contact would enhance efficiency and productivity.

Keywords: male and female farmers, sweet potato, technical efficiency.

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1. Introduction

Sweet potato originated from Central America and spread rapidly to Asia and Africa during the 17th and 18th centuries respectively and has become an important crop in many areas of the world (van An, 2004). It ranks among the five most important food crops in the tropical areas where a high population of the world's poorest people live (Woolfe, 1992). Sweet potato is the only member of the genus *Ipomoea* whose roots are edible and which has a positive per capita annual rate of increase in production in Sub-Saharan Africa (Tewe *et al.*, 2003). It has a high yield potential that may be realized within a relatively short growing season (Tewe *et al.*, 2003) and is adaptable to a wide range of ecological conditions. As a crop that requires low inputs of land, labour and capital and less management in its production; it does well on marginal soils, giving reasonable yield than most other crops (Islam *et al.*, 2002; Attaliru and Ilangantileke, 2007) and has become one of the world's most important food crops due to its high yield and nutritive value (Data and Eronico, 1987).

Sweet potato is treated as a minor crop in Nigeria (Tewe *et al.*, 2003); ranking behind the other root crops. Therefore, aggressive research efforts are needed to harness the potentials of the crop. Ndukwu (2010) noted that there is a dearth of information on the economics of the production of the crop. Moreover, various researches conducted on the contribution of women to agricultural development in the Nigeria (Dixon, 1982; Auta, *et al.*, 2000; Nwaru, 2004; Iheke, 2006; Damisa, *et al.*, 2007) place the contribution of women as high as between 70 to 85 percent of both family and hired labour for farm activities and this includes sweet potato production (Babatunde *et al.*, 2007). Empirically investigating the dominant and important roles women play in agricultural production with respect to sweet potato production would be contributory to efforts at creating a vibrant paradigm for resource employment and increased food production in Nigeria.

Therefore, the objective of this study was to measure the level of technical efficiency and its determinants in sweet potato production in Imo State of Nigeria among men and women farmers. Technical efficiency here refers to the ability of the farmer to produce the highest level of output with a given bundle of inputs. It indicates all the gains obtainable by simply gingering up the optimal management of production

resources (Farrel, 1957; Iheke, 2006). It is believed that the productivity of farmers could be enhanced through enhancing their technical and allocative efficiencies in response to better information and education (Idiong, 2006). Moreover, with the difficulties encountered by farmers in developing countries for developing and adopting improved technologies due to resource poverty, improving efficiency has become a very significant factor in increasing productivity (Ali and Chandry, 1990). The drive is for the farmers to allocate their resources to those productive ventures that earn higher returns for each unit of resource spent (Iheke, 2006). There might be re-allocation of available resources if they expect to benefit more from such economic actions (Nwaru and Iheke, 2010).

2. Methodology

Study Area: This study was conducted in Imo State of Nigeria. Imo State is bounded in the north by Anambra State, in the east by Abia State and south by Rivers State. The State comprises of 27 Local Government Areas, each with several communities and villages. It has three Agricultural Zones, namely Okigwe, Owerri and Orlu Agricultural Zones. Imo State covers an area of 5100 km² with a population of about 3.934 million people in 2006. Agriculture is the major occupation of the people of the State. Almost all the families farm either as primary or secondary occupation. The ecological zone favours the growing of tree crops, roots and tubers, cereals, vegetables and nuts (Nwaru, 2004).

Sampling and Data Collection: A multi-stage sampling technique was used in choosing the sample. In the first stage, two out of the three Agricultural zones were purposively selected based on performance in sweet potato production and these were Owerri and Okigwe. In the second stage, two Local Government Areas were purposively selected from each Agricultural Zone based on sweet potato production performance; they were Ohaji/Egbema and Owerri North from Owerri Zone and Ihitte Uboma and Okigwe from Okigwe Zone. In the third stage, two communities were selected randomly from each Local Government Area giving a total of eight communities sampled. The lists of sweet potato farmers in each sampled community were prepared with the help of the community leaders and agricultural extension agents assigned to the communities sampled. These lists formed the frames from which a random sample of one hundred and twenty sweet potato farmers (64

females and 56 males) was chosen for a detailed study.

The researchers, supported by some trained enumerators, visited the farmers forth nightly (using the cost-route approach) in the 2009 cropping season to collect pieces of information from them. Primary data collected were on sweet potato output, prices, size of land cultivated, labour input, farming experience, other farm costs and materials used in sweet potato production such as sweet potato vines, fertilizer and farm implements. Some socio-economic and demographic characteristics of the respondents such as age, sex, household size, occupation (primary and secondary), farm size and membership of cooperative societies were obtained.

Analytical Procedure: Descriptive statistics were used to analyse the socio-economic characteristics of the farmers. The Cobb-Douglas functional form, using the stochastic frontier was used to estimate the technical efficiency of the farmers and their determinants. A stochastic frontier production function is given as:

$$Y_i = f(X_i; \beta) \exp. (V_i - U_i), \quad i = 1, 2, \dots, n \quad (1)$$

Where Y_i is the output of the i -th farm, X_i is the vector of input quantities used by the i -th farm, β is a vector of unknown parameters to be estimated, $f(\cdot)$ represent an appropriate function such as Cobb-Douglas, translog, etc; V_i is a symmetric error accounting for the effect of random variations in output due to factors beyond the control of the farmer e.g. weather, disease outbreaks, measurement errors, etc. V_i is assumed to be independently and identically distributed as $N(0, \delta_v^2)$ random variable independent of the U_i s. It is a non-negative random variable representing inefficiency in production relative to the stochastic frontier. The U_i s are assumed to be non-negative truncations of the $N(0, \delta_u^2)$ distribution, that is, half normal distribution. They are non-negative random variables associated with technical inefficiency in production.

The stochastic frontier model was independently proposed by Aigner *et al.* (1977) and Meeusen and Van den Broeck (1977). Its major advantage is that it provides numerical measures of technical efficiency for an individual farmer. This is defined in terms of the ratio of the observed output to the corresponding frontier output given the available technology.

$$\begin{aligned} \text{Technical efficiency (TE)} &= Y_i/Y_i^* = f(X_i; \beta) \exp. (V_i - U_i) / f(X_i; \beta) \exp. (V_i) \\ &= \exp (-U_i) \end{aligned} \quad (2)$$

Where Y_i is the observed output and Y_i^* is the frontier output and other parameters remain as defined in equation (1). The parameters of the stochastic frontier models are estimated using the maximum likelihood techniques (Aigner *et al.*, 1977).

The empirical model used in estimating the level of technical efficiency was specified as:

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + V_i - U_i \quad (3)$$

Where, \ln is natural logarithm; Y_i is the output of potato in Kg; X_1 is labour input (mandays); X_2 is quantity of sweet potato vine planted (kg); X_3 is fertilizer used (kg); X_4 is capital (Naira) which was measured as depreciation charges on farm tools and equipment, interest on borrowed capital and rent on land; X_5 is farm size (hectares); β_0 is intercept estimated and which represents autonomous output; $\beta_1 - \beta_5$ are parameters estimated while V_i and U_i are as defined in equation (1).

Determinants of Technical Efficiency

In order to examine factors contributing to the observed technical efficiency in sweet potato production, equation (4) was formulated and estimated jointly with equation (3) in a single stage maximum likelihood estimation procedure using the computer software Frontier Version 4.1 (Coelli, 1996).

$$TE_i = b_0 + b_1 Z_1 + b_2 Z_2 + b_3 Z_3 + b_4 Z_4 + b_5 Z_5 + b_6 Z_6 + b_7 Z_7 + b_8 Z_8 \quad (4)$$

Where TE_i is the technical efficiency index of the i -th farmer; Z_1 is the age of the farmer (in years); Z_2 is the household size (in number); Z_3 is the farm size (in hectares); Z_4 is the level of education (in years); Z_5 is the farming experience (in years); Z_6 is the access to credit (access = 1; otherwise = 0); Z_7 is membership of co-operative society or local farmers' association. This is a dummy which is unity if the farmer is a member to a co-operative society or local farmers' association and zero if otherwise; Z_8 is number of extension visits to the farmer; $b_{i(i=0,1,..8)}$ and $\beta_{i(i=0,1,..5)}$ are parameters yielded together with the individual efficiency indices by the estimation of equations (3) and (4).

3. Results and Discussion

The average statistics of the sampled sweet potato farmers were summarized and presented in Table 1. On the average, a typical male sweet potato farmer was 45 years of age with 7.33 years of formal education, about 9 years of farming experience, a household size of about 7 persons, cultivated 0.41 hectares of land, employed 28.56 mandays of labour and produced an output of 138.91kg of sweet potato per annum. For a typical female sweet potato farmer, she was 44 years old, with 8.18 years of formal education, about 8.30 years of farming experience, household size of 6 persons, cultivated 0.36 hectares of land, employed 24.80 mandays of labour and produced 104.70kg of sweet potato per annum.

Table 1: Average statistics of male and female sweet potato farmers in Imo State

Variable	Mean Value		Maximum Value		Minimum Value	
	Male	Female	Male	Female	Male	Female
Age (yrs)	49.893 (10.243)	45.188 (8.972)	68.00	62.00	25.00	29.00
Formal education (yrs)	9.357 (5.065)	11.203 (5.769)	19.00	16.00	0.00	0.00
Farm size (ha)	0.413 (0.036)	0.360 (0.034)	0.76	0.68	0.01	0.01
Farming experience (yrs)	9.321 (4.005)	8.308 (2.480)	16.00	17.00	1.00	1.00
Household size (no.)	8.000 (2.630)	7.000 (2.537)	14.00	15.00	3.00	2.00
Labour (mandays)	28.566 (4.157)	24.580 (3.885)	91.20	83.40	3.43	2.90
Fertilizer (Kg)	30.143 (19.340)	21.609 (18.079)	75.00	70.00	0.00	0.00
Capital (N)	278.071 (83.791)	355.390 (101.905)	530.00	614.00	134.0 0	120.00
Output (kg)	138.911 (49.822)	104.703 (44.647)	322.85	307.50	38.30	24.10
	n = 56	n = 64				

Source: Survey data, 2008

(.) Standard deviation

Results in Table 2 indicate maximum likelihood estimates of the stochastic frontier production function for sweet potato. The Table indicates that the total variance is

statistically significant for male ($p=0.05$) and female ($p=0.01$) farmers. This indicates goodness of fit and the correctness of the specified distribution assumptions of the composite error terms. The variance ratios were significant and estimated at 0.9848 and 0.9750 for the male ($p=0.01$) and female (0.01) farmers. These indicate that 98.48 percent and 97.50 percent of the total variation in sweet potato output for the male and female sweet potato farmers respectively was due to technical inefficiency. The coefficients for fertilizer and farm size had the desired positive signs and were statistically significant for both farmer groups, implying direct relationship with output. Sweet potato vine had a direct relationship with output and statistically significant at 10 percent for the male farmers only. Labour and capital had positive and significant coefficients for the women farmers only.

Table 2: Estimated production functions for male and female farmers

Variable	Parameter	Male	Female
Intercept	β_0	6.5047 (16.8866)***	5.6653 (12.1401)***
Labour	β_1	-0.1563 (-1.3668)	0.3348 (2.1383)**
Sweet potato vine	β_2	0.1256 (1.7315)*	0.1092 (1.0690)
Fertilizer	β_3	0.0211 (9.3362)***	0.0363 (2.0650)**
Capital	β_4	-0.2157 (-0.4565)	0.2143 (3.5535)***
Farm size	β_5	0.3436 (9.1988)***	0.2209 (3.7483)***
Diagnostic statistics			
Total variance	σ^2	0.1396 (5.2533)***	0.3265 (2.4436)**
Variance ratio	γ	0.9848 (106.4513)***	0.9750 (74.9917)***
LR Test		68.3924	56.9761
Log-likelihood function		25.8206	21.1464

Source: Computed from Survey data 2008, (.) are computed t-value.

***, **, * are significant levels at 1%, 5% and 10% respectively.

The frequency distribution of technical efficiency in sweet potato production is presented in Table 3. The result indicates that the male technical efficiency indices

ranged between 31 percent and 98 percent with a mean of 85 percent, while the female technical efficiency indices ranged between 73 percent and 99 percent with a mean of 92 percent. The Table further indicates that about 80.36 percent of the male and 92.19 percent of the female farmers had technical efficiency indices of 80 percent and above. This implies that an average sweet potato farmer has some room for productivity increase through increases in efficiency. It would take the average and the least efficient male farmers about 13 percent derived by $(1 - 0.85/0.98)100$ and 65 percent derived by $(1 - 0.31/0.98)100$ cost saving respectively to become the most efficient farmer. Similarly, for the average and the least technically efficient female farmers to attain the efficiency level of their most efficient counterparts, they would need cost saving of about seven percent derived as $(1 - 0.92/0.99)100$ and 26 percent derived as $(1 - 0.73/0.99)100$ respectively.

Table 3: Distribution of the farmers according to technical efficiency indices

Range of technical efficiency indices	Male		Female	
	Frequency	Percentage	Frequency	Percentage
0.30 – 0.39	3	5.36	-	-
0.40 - 0.49	1	1.78	-	-
0.50 – 0.59	2	3.57	-	-
0.60 – 0.69	1	1.78	-	-
0.70 – 0.79	4	7.15	5	7.81
0.80 – 0.89	10	17.86	8	12.50
0.90 – 0.99	35	62.50	51	79.69
Total	56	100.00	64	100.00
Maximum	0.98		0.99	
Mean	0.85		0.92	
Minimum	0.31		0.73	

Source: Computed from Survey data 2008

The estimated determinants of technical efficiency in sweet potato production were summarized and presented in Table 4. The coefficients for age, level of education and membership of cooperatives of potato farmers were positive for both group of farmers but insignificant even at 10 percent level indicating that none of them had meaningful effects on technical efficiency in potato production. These are contrary to *a priori* expectations and to Idiong (2007) who reported significant result between

technical efficiency and education and membership of cooperative but reported an insignificant result for age and extension visits to the farmer.

These results are in agreement with Seyoum *et al.* (1998) and indicate that the pieces of advice from extension workers were beneficial in helping farmers implement the practices associated with new technology. Nwaru (2001) opined that, by ensuring that resources are better mobilized and more efficiently used, a vibrant and functional extension system could be a solution to the problem of acute scarcity of resources in the rural economy which is complicated by inefficiency of use of such resources.

Table 4: Estimated determinants of technical efficiency

Variable	Parameter	Male	Female
Intercept	Z ₀	-0.001 (-0.001)	1.263 (1.112)
Age	Z ₁	0.021 (1.433)	-0.022 (-1.011)
Household size	Z ₂	0.080 (1.737)*	0.116 (1.360)
Farm size	Z ₃	-10.991 (-2.138)**	3.955 (9.800)***
Level of education	Z ₄	-0.024 (-1.067)	-0.001 (-0.013)
Farming experience	Z ₅	0.183 (5.311)***	0.441 (3.052)***
Credit access	Z ₆	0.513 (2.399)**	0.905 (1.947)*
Co-operative membership	Z ₇	0.147 (0.739)	-0.538 (-0.012)
Extension visit	Z ₈	-0.304 (-1.553)	0.831 (2.637)**

Source: Computed from Survey data 2008, (.) are computed t-value.

***, **, * are significant levels at 1%, 5% and 10% respectively.

Coefficient for extension visits was negative and insignificant for the male farmers contrary to *a priori* expectations but positive and significant (p=0.05) for the female farmers in agreement with *a priori* expectations. Pieces of advice from extension

workers were expected to be beneficial in helping farmers implement the practices associated with new technology. The present result indicates that the more the number of contacts a female farmer makes with extension services, the more she receives superior technical advice which translates to higher levels of entrepreneurship and efficiency, *ceteris paribus*. Therefore, policies and programmes aimed at strengthening the extension system especially when targeted more at the female farmers would be good.

The coefficient of farming experience was positive and significant for both farmer groups. This implies that farmers with more years of experience tend to be more efficient in sweet potato production. This result agrees with *a priori* expectations and Adeoti (2004), Idiong (2005), Okoye (2006) and Nwaru (2007) but differed from Onu *et al.* (2000) who reported a negative relationship between technical efficiency and experience and Idiong (2007) who reported a positive but insignificant relationship between technical efficiency and experience. Experience may be defined as the knowledge and skill gained by contact with facts and events (Nwaru, 2004). It gives an indication of the practical knowledge and skills gained over time on how to overcome most of the core problems confronting increased agricultural production and output processing and marketing. The present result implies that programmes and policies for enhancing efficiency in sweet potato production should be targeted more at experienced farmers.

The coefficient for credit was positive and significant for both farmer groups. The implication is that farmers with more access to credit are expected to have higher technical efficiency level than those with less access to credit. This result agrees with *a priori* expectations and Onyenweaku and Nwaru (2005), Idiong (2007) and Ndukwu (2010) but differs from Okike (2000), who reported a negative relationship between credit and technical efficiency. Farmers' access to credit at the right time and amount enhances their adoption of improved technologies and timely acquisition of necessary and complimentary production inputs, *ceteris paribus*, which leads to higher levels of farm efficiency and output. Therefore, efforts at enhancing farmers' access to credit would be highly rewarding.

Farm size was significant for both farmer groups. This agrees with *a priori* expectations and Onyenweaku and Okoye (2007) and Dimelu *et al.* (2009). However,

coefficient for farm size was negative for the male farmers, implying probable use of farmland beyond its marginal value product. On the other hand, it was positive for the female farmers, implying a direct relationship with technical efficiency. These relationships may be consistent with the practice in the rural setting in which access to land is majorly by inheritance through descent and this is in favour of the male farmers. They further point to the need for land resource reallocation from the male farmers to the females as a step towards increasing efficiency and optimal use of land resources. This is more pertinent because land and labour are the most critical inputs in traditional agriculture (Nwaru, 2004).

Traditionally, rural households count more on their household members than hired workers as sources of farm labour. The coefficients for household size had a direct relationship with technical efficiency and was significant ($P=0.10$) for the male farmers but insignificant for the female farmers. This is at variance with Nwaru (2004) who reported a significant but negative relationship between technical efficiency and household size and with Dimelu, *et al.* (2009) who rather reported a significant and positive result for the female farmers and insignificant although positive result for the male farmers. The present result implies that female household size does not influence their efficiency in sweet potato production.

4. Conclusion

The results of this study indicate that individual technical efficiency levels for the male farmers ranged between 31 percent and 98 percent with a mean of 85 percent, while that of the female farmers ranged between 73 percent and 99 percent with a mean of 92 percent. That none of the farmer group members achieved an individual efficiency index of unity implies that ample room exists for increases in output through increases in technical efficiency. Important factors directly related to technical efficiency for both farmer groups are farming experience and credit. Therefore, policies aimed at improving the technical efficiency and hence output of the farmers should involve making credit accessible to them and should be targeted more at experienced farmers.

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THE EFFECTS OF EARLY CHILDHOOD EDUCATION ATTENDANCE ON COGNITIVE DEVELOPMENT: EVIDENCE FROM URBAN ETHIOPIA¹

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Abbreviation

PPVT	Peabody Picture Vocabulary Test
CDA-Q test	Cognitive Development Assessment – Quantity test
OLS	Ordinary least square
IV	Instrumental variables
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UNICEF	The United Nations Children's Fund
MoFED	Ministry of Finance and Economic Development
EDRI	Ethiopian Development Research Institute
MoE	Ministry of Education
YL	Young Lives
YC	Younger cohort
OC	Older cohort
SNNP	Southern Nation and Nationalities People
NGO	Non-Governmental Organizations

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² Young Lives is an international study of childhood poverty that follows 12 children in four countries namely Ethiopia, India, Vietnam and Peru (for details of the young Lives look at www.younglives.org.uk)

Abstract

Studies in developed countries indicate that preschool education can have strong impact on children's cognitive development, but there are no studies conducted in the context of developing countries including Ethiopia where pre-school education is left for private sector. To see if government investment in pre-school education is worth, we examined the effects of early childhood education attendance on cognitive development of preschool age children. Using data obtained from the Young Lives Longitudinal Survey in Ethiopia, we measured cognitive development of children by Peabody Picture Vocabulary Test (PPVT) and Cognitive Development Assessment – Quantity (CDA-Q) Test. We employed standard instrumental variable estimation, Wooldridge instrumental variable estimation and propensity score matching techniques to see the degree of association between preschool enrolment and cognitive outcome of five years old children. Across all these models, the results persistently show that early childhood education attendance is positively associated with children's cognitive development. More specifically, from propensity score matching result, children who have been attending preschool education have scored 31.2% higher in vocabulary test and 23.1 % in quantitative test than those of non-preschool attendees. The implications of these results are quite crucial and timely for the Ethiopian government. Despite the fact that preschool education increases children's cognitive development, public investment in this critical stage of education is currently very low in the country and left for the private sector. As a result, the subsector is dominated by fee charging kindergartens in which children from low socioeconomic background do have very little opportunity to attend this first and critical stage of education implying that government has to do more in this first and essential stage of education.

1. Introduction

It is widely recognized that early childhood education is an integral part of basic education and it could be an essential step in achieving the goals of Education-for-All (UNESCO, 1996) in particular and human skill formation in general (see, among others, Cunha et al., 2006; Hackman, 1999; Currie 2001; Goodman and Sianesi, 2005). A good reason is that a well-conceived quality of early childhood education helps to meet the diverse needs of young children during the crucial early years of life, enhance their readiness for schooling, and have a positive and permanent influence on later schooling achievements (Carneiro, et al. 2006). For this reason, Woodhead (2009) states that early education may be the single most effective intervention for helping poor children, families, communities and nations break the intergenerational cycle of poverty.

The effect of early childhood education is not only limited to cognitive development of young children, but also to a number of non-cognitive skills such as motivation, self-discipline, socialization (see, Heckman, 1997; Cunha et al., 2006). More remarkably, these cognitive and non-cognitive skills interact and reinforce each other, characteristics termed as *self* and *cross-productivity* (Carneiro, et al., 2003; Helmers and Patnam, 2009). Nevertheless, the rationale here is that as cognitive ability is less malleable later in life than non-cognitive ability, intervening to improve cognitive functioning should be given more attention early in life. Additionally, cognitive skills are also much easier to measure at early ages compared to the non-cognitive skills (Connelly, 2008).

Nevertheless, in most developing countries a large share of children start education late in their ages and directly join primary schools skipping the nursery and kindergarten. As a result of this phenomenon, it is very common to see that high grade repetition and dropout rates are the main characteristics of their education sectors (UNESCO, 2005). The fact is that children with low levels of cognitive development before they enter school have lower school achievement and earn lower wages in their later lives (Currie and Thomas 2000; Case and Paxson 2006; Macours et al., 2008). Heckman (2006) also adds that low investment in childhood development in the first few years of life leads to lower cognitive development and reduces school performances, which have again a long-lasting adverse effect on

human skill formation. Based on these grounds, low levels of cognitive development during early years of life have been tied to poor performance in school in a number of settings in those developing countries (Grantham-McGregor et al. 2007).

In the industrialized countries, to appreciate that early childhood education serves as a pathway for educational quality and in turn the acquired cognitive development is one of the basic predictors of success throughout life, many empirical studies are done on the link between early childhood education and cognitive development (see, Susanna et al., 2005; Magnuson, 2004; Campbell et al., 2002; Goodman, 2006). However, much less attention has been devoted to studying this kind of critical link in most developing countries, of which Ethiopia is one; and nor investment in early childhood development is seen as a critical foundation for school readiness and achieving success in school and life (Macours et al., 2008).

For instance, when we examine the nature of early childhood education in Ethiopia, It is predominantly provided by the private sector, non-government organizations, religious institutions, etc. Except in some technical support and quality monitoring, the government has very limited intervention in this critical stage of education. The point is that preschool education in Ethiopia is not compulsory and neither is any budget allotted by government for it. It is rather dominated by fee charging nursery schools and kindergarten which mainly supply to the needs of middle class parents living in urban and semi-urban areas of the country. Due to this nature of setting up, the enrolment rate of the subsector is very undersized. For example, in 2008/09, the gross enrolment rate of the country was only about 4.2% and concentrated in urban areas, mainly in Addis Ababa. This is a striking figure compared to the 94.2% (83%) national gross (net) enrolment of primary education for the same year. More specifically, at national level, 22.9% of pupils enrolled in grade one in 2008/09 had left school before reaching grade two. Likewise, the survival rates to grades five and eight were 78.9% and 43.6%, respectively. The primary education system also suffers from large numbers of out-of- school children and over-age children. Those entire situations put a logical question does preschool education help children to enter primary school at appropriate age, reduce their dropouts and repetition (UNICEF, 2007).

This paper aims to analyse the effects of early childhood education attendance on children's cognitive development using a unique Young Lives Longitudinal Data. To be specific, the objectives of this study are:

- To examine the pattern and trends of early childhood education enrolment;
- To analyse the effects of early childhood education on cognitive development of five years old children;
- To identify the main challenges that this subsector encounters; and
- To infer possible policy insights for the identified challenges in the subsector.

It is also equally important to note that the terms early childhood education and preschool education are used interchangeably in this study. Therefore, early childhood– or preschool – education in this study refers to educational efforts between three and six years of age that aim at fostering cognitive, social, motivational and emotional development of young children in order to provide them with a good start in formal primary education. A good start in primary school, in turn, increases the likelihood of favourable educational and social outcomes later in life.

Estimating the impact of preschool on cognitive development is problematic as there is selection problem in preschool enrolment, which biases the results. We tried to reduce the bias by using propensity score matching where children in preschools are matched to those who did not enrol in preschool using the characteristics of the parents, shocks household encountered and initial household wealth and composition before the children were born and reached the age of three and five. We also used instrumental variable estimation method in which the instruments are highly correlated with the preschool, but not with the outcome (cognitive score). We also used Wooldridge approach in which the propensity score (predicted probability from a probit model) is used as a main or excluded instrument (Wooldridge, 2002). Moreover, we have conducted relevance and validity test to see if the chosen instruments are correlated with the endogenous variables, but not with the error terms (Wooldridge 2002).

The finding of this study contributes to the existing literature in a number of ways. First, we document a clear association between early childhood education and cognitive development of children in Ethiopia that enable children to enter formal

education ready to learn. Hence, this will cast an interesting implication for the expansion of public preschools, which are believed to be the foundation for sustainable educational quality (UNICEF, 2007). Second, beyond the supply side response, it may create a demand side response, in the sense that most people consider preschool as a luxury and can be substituted easily by the primary school. So, this study sheds some insight for creating communities' awareness to send their children to preschool education at their appropriate ages so that better educational performance can be achieved in the future. Moreover, this study also adds one developing country, Ethiopia, into the existing educational empirical literature.

The rest of the paper proceeds as follows. Section 2 presents related literature review together with assessment of the Ethiopian early childhood education trends. Section 3 lays the framework for the econometric analysis while section 4 presents the descriptive statistics and section 5 contains the empirical results. Concluding remarks are provided in section 6.

2. Literature Review

2.1 The Rationale for Early Childhood Education Investment

The early years of life are so critical for the acquisition of concepts, skills and attitudes that lay the foundation for lifelong learning (Cunha et al., 2006; Carneiro and Heckman, 2003). The fact is that early childhood is a sensitive period marked by rapid transformations in physical, cognitive, language, social and emotional development. It represents a window of opportunity for a lifetime development of a person (UNESCO, 2010). This is the time when children's brains development advances at a pace greater than any other stage in life. For example, childhood development researches indicate that by the age of 2½ years, a child's brain has achieved 50% of its adult weight, and by the age of 5, the brain has grown to 90% of its adult weight. In addition, many of the brain's structures and biochemical routes are developed in the first two years of life (see Bruner, 1999; Halfon et al., 2001). In view of that, Heckman (2009) states that the process of skill formation would be easier at early period as it is possible for this skill to grow along with the development of brain neurons. This implies that human skill formation is a multi-stage process (Figure 2.1) in which investment is done at preschool age, during school age and post school age -job training - (Cunha et al., 2006). For that reason,

the theory of human capital emphasizes, among others, on the significance of early childhood education for its initial formation (Heckman and Klenow, 1997; Cunha and Heckman; 2003).

Over recent years, based up on the traditional theory of human capital (e.g., Becker 1962), a number of authors have developed a model of skill formation technology that allows to assess education and training policies over the life cycle of a person (see, among others, Heckman 2000; Carneiro and Heckman 2003; Cunha et al. 2006). The key insight of this skill formation model is that the formation of skills is a life cycle process that demonstrates both self- productivity and complementarity (Cunha et al., 2006). By self-productivity, we mean that education learned at one stage is an input into the learning process of the next stage, implying that skills are self-reinforcing. Similarly, by complementarity we mean that productivity with which investments at one stage of education are transformed into valuable skills is positively affected by the level of skills that a person has already obtained in the previous stages, implying that skills produced at one stage raise the productivity of investment at subsequent stages (Cunha et al., 2006; Woessmann, 2006).

Jointly, these features of self-productivity and complementarities produce a skill multiplier whereby an investment in education at one stage raises not only directly the skills attained at that stage, but also indirectly the productivity with which educational investments at the next stage will be transformed into even further skills (Carneiro and Heckman 2003; Cunha et al., 2006; Woessmann, 2006). These multiplier effects explain why education is a dynamic synergistic process in which early learning begets later learning and the sooner it begins the greater the returns from it (Heckman and Klenow, 1997; Cunha et al., 2006).

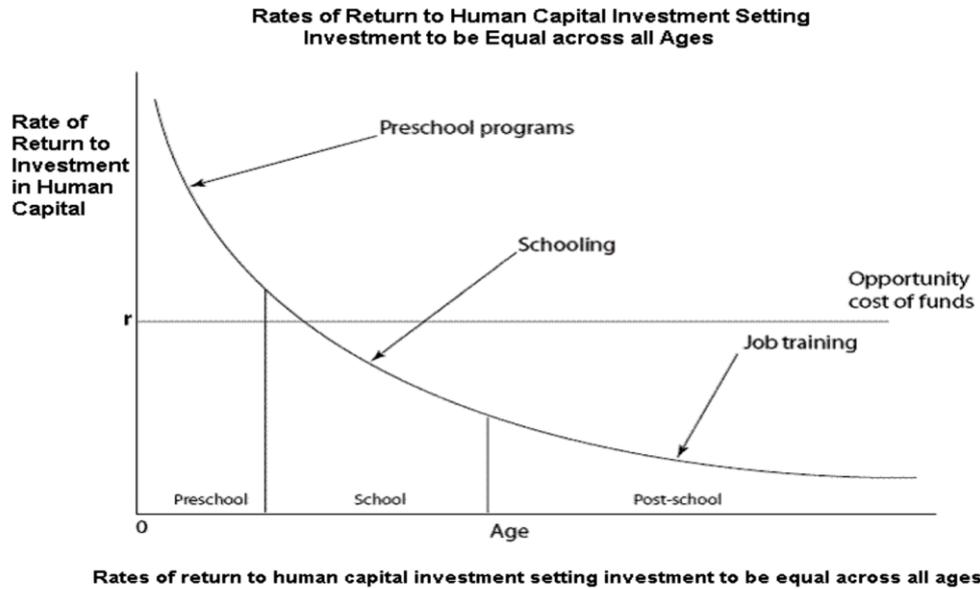
The human capital argument also stresses that there are multiple important skills, both cognitive and non-cognitive, and that for some of these skills (most notably on the cognitive side), there are sensitive or even critical periods in a person's life cycle where investments are particularly effective or even crucial, and that inadequate early investments are difficult and costly to remedy later on (Cunha et al., 2006; Woessmann, 2006). This signifies that investment on education is better to those who start at their early stage of development than later years as young children's cognitive ability and behavior are more malleable compared to adults (Connelly,

2008). By the same token, Heckman and Masterov (2007) also provide productivity argument for investing over young children ascertaining the importance of early education by their maxim in the following ways:

Skill begets skill; learning begets learning. Early disadvantage, if left untreated, leads to academic and social difficulties in later years. Advantages accumulate; so does disadvantage. That is why, a large body of evidence shows that post-school remediation programs like public job training and General Educational Development (GED) certification cannot compensate for a childhood of neglect for most people.

All these ideas underpin the case over the importance of early childhood education investment as relevant for the development of cognitive and non-cognitive ability and have profound implications for the efficiency of different policies that aim at fostering human capital. Taken from Cunha et al. (2006), the curve in Figure 2.1 summarizes the theoretical evidence on the rate of return to investment at different stages of the life cycle. The horizontal axis represents age, which is a proxy for an individual's stage in the life cycle of skill formation. The vertical axis represents the rate of return to investment assuming the same amount of investment is made at each age. The figure demonstrates that there is a higher rate of return at younger ages for equal amount of investment across the individual's years of life. The main idea of the figure is that learning is easier in early childhood than later in life, and cognitive stimulation early in life are critical for long-term skill development (Shonkoff et al., 2000; Cunha and Heckman, 2003). However, the economic argument for early investment does not preclude later investment; rather it argues that there are dynamic complementarities to be gained from investing at different stages of the life cycle that makes skill formation is a multi-stage process (Cunha et al., 2006; Orla Doyle et al., 2010).

Figure 2.1: Rate of return to human capital investment

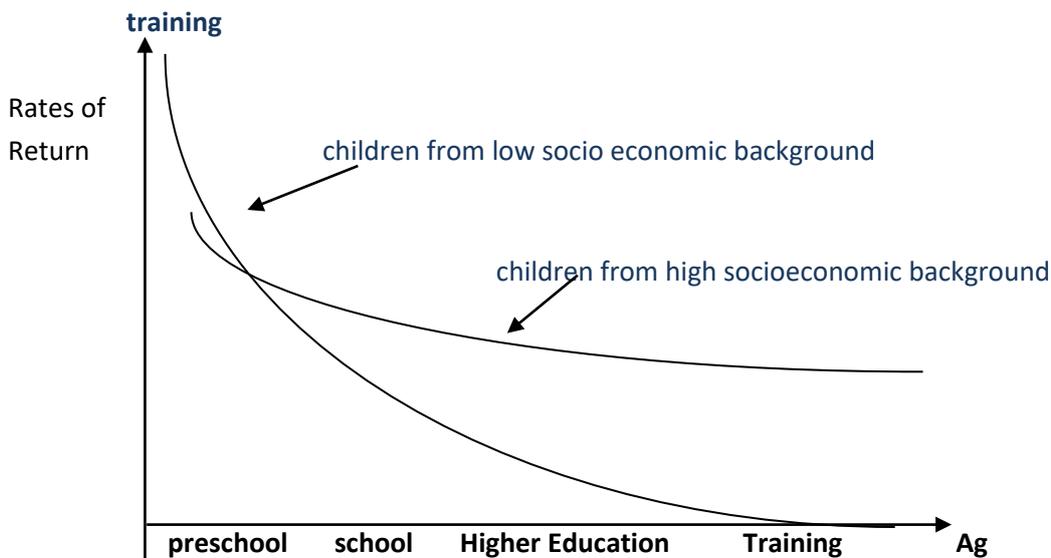


Source: Cunha et al. (2006)

Furthermore, in the education sector it is widely argued that there is always a trade-off between efficiency and equity objectives, and that one can only be achieved at the expense of the other. However, Eurydice network (2009) notes that, viewed in a wider perspective, equity and efficiency are in fact mutually reinforcing in early childhood education. It is both more efficient and more equitable to invest in education very early: correcting failure later on is not merely inequitable, but highly inefficient in comparison. This is so not only because early childhood education facilitates later learning, but also because it can produce large socio-economic returns, especially for disadvantaged children (Heckman, 1999, Eurydice network, 2009). Currie (2001) additionally suggests that it may be more effective for a government to equalize initial endowments through early childhood development programs than to compensate for differences in outcomes later in life. And she hypothesizes that families may under-invest in early childhood because of market failures such as liquidity constraints and information failures. Hence, public investments in quality early childhood education can produce important long-term improvements in the intellectual and social development of disadvantaged children. Supporting this concept, Cunha et al. (2008) and Woessmann (2006) state that

return to educational investments tend to be highest for children from disadvantaged families at early stages and for the well-off at late stages of the life cycle. Taken from Woessmann (2006), the two curves, in Figure 2.2, illustrate that returns to early interventions are particularly high for children from disadvantaged backgrounds whose homes do not provide them with the foundation of skills necessary to prosper at later educational stages, but at older ages, they tend to be higher for children from well-off families. This implies that in the absence of public involvement, rates of return turn down more rapidly for children from low than from high socio-economic background. This in turn reveals complementarities between efficiency and equity at early stages and trade-offs at late stages

Figure 2.2: Stylized returns for a dollar spent at different stage of education and training



Source: Woessmann (2006), (originally adapted from Cunha et al. (2006))

In fact, beyond the human capital argument, there is growing recognition that all reasonable plans for human development begin early with measures to protect the rights of the child rather than wait for 18 years later. The UN Convention on the Rights of the Child (United Nations, 1989) has had a long history of supporting and encouraging interventions aimed at children and families. The human rights argument holds that children have a right to live and develop to their fullest potential. In line with this argument, organizations such as UNESCO and UNICEF strongly encourage investment in integrated early childhood programs as allowing

children to live in environments without adequate health and well-being as well as the right to free education directed at the full development of the human person is a violation of the most basic human rights.

Moreover, in addition to the human capital argument, there is a strong justification from the human rights side, which remarkably argues that the responsibility to protect a child's human rights is the most fundamental reason to invest in programs that enhance early childhood development (Myer, 1995; Woodhead, 2009).

2.2 A review of Previous Studies: Experience of Other Countries

Huge body of empirical works that demonstrate the effects of early childhood education on a child's cognitive; language and social development are found mainly in North America and Western Europe, particularly in the United States. Still, only little has been learned about the relationship between early childhood education and child outcomes in settings outside of the developed countries although comparable research is being done in a growing number of developing countries (UNESCO, 2010). As the result, to reach in meaningful concluding remarks of the present study, it would be imperative to draw some lessons (experiences) from the developed; and if any from the developing countries as well.

In light of these facts, it would be sensible to start the review from the USA as it has rich experiences of preschool interventions. For instance, using data from the early childhood longitudinal study, Susanna et al. (2005) examines the influence of preschool centres on children's cognitive and social development. To identify the effects, the authors employed OLS, instrumental variables (IV) and matching estimates. The main findings indicate that preschool centres raise reading and math scores, but has a negative effect for socio-behavioural measures. More specifically, the duration of centre-based care matters: the greatest academic benefit is found for those children who start at ages 2–3 rather than at younger or older ages; negative behavioural effects are greater the younger the start age. These patterns are found across the distributions of family income. The intensity of centre-based care also matters: more hours per day lead to greater academic benefits, but increased behavioral consequences. Similarly, Magnuson (2004), using nationally representative longitudinal data of US children who joined pre-primary school in

1998-99 and finished first grade in 2000, analyses whether prekindergarten increases school readiness at kindergarten entry and whether any of the effects last long. In the analysis, controlled by various socioeconomic variables and state dummies, prekindergarten attendance is instrumented by state expenditures spent on early childhood education and care. The findings from IV estimator and matching regression indicate that prekindergarten increases math and reading skills at kindergarten entry, but are also associated with an increase in behavioural problems. Furthermore, while the cognitive gains largely fade out by the spring of first grade, the negative effects on class-room behaviour do not. In fact, the largest and most lasting academic gains were found for disadvantaged children.

Campbell et al. (2002) also examine the effect of Abecedarian Project, which is a scientific experimental centre, on children cognitive and non-cognitive behaviour by considering data for the years between 1972 and 1977. The result of OLS and matching regression shows that the treated children on average have relatively higher cognitive ability, which is captured by test scores, than untreated children. The treated children got higher results on reading and mathematical skills and attend more years of schooling compared to untreated and even they are more likely to join college or university. Additionally, the result of this study shows that the difference in cognitive ability between the treated and untreated is wider for girls than boys. Looking at non-cognitive skills, the result shows that teen pregnancy is greatly reduced though it was not possible to avoid it totally. Furthermore, using the Chicago Longitudinal Study (CLS), Reynolds et al (2000) study the impact of public preschools between 1983 and 1985 on children development outcomes. The study contained 1150 young children living in poverty. The centres provided services for children between the ages of 3 and 9, ensuring a stable transition from preschool to early elementary school. The children were enrolled for varying lengths of time, which allowed the researchers to examine the long-term effects of differing levels of participation beginning at different ages. The comparison group of 380 children was randomly selected from selected schools in poor neighbourhoods. The preschool program was a half-day experience and primary grades were full day. The program had no set curriculum, but included a structured set of activities that promote basic math, language and reading skills and encouraging psychological and social development. The study followed the participants through age 21. Results of the study demonstrate that children who were involved in the program had higher

reading and math scores during adolescence than those who had not participated. Children who were involved in the program had experienced lower retention rates and lower special education placement by age 20. Children who participated in full-day kindergarten intervention had significantly lower rates of special education and grade retention. Cost-benefit analysis of the program indicates that every dollar invested in the preschool program returned \$7.14 in education, social welfare, and socioeconomic benefits by reducing public expenditures for remedial education, criminal justice treatment, and crime victims.

Taking any early schooling (before the compulsory starting age of 5) and of preschool on a cohort of British children born in 1958, Goodman et al. (2005) assess whether any effects on cognition and socialization are long-lasting, as well as their net impact on subsequent educational attainment and labour market performance. Employing fully interacted linear model and matching method (the so-called average effect of treatment on the treated – ATT); and controlling for a particularly rich set of child, parental, family and neighbourhood characteristics, early education is found to have positive and long-lasting effects. Specifically, pre-compulsory education (preschool or school entry prior to age 5) was found to yield large improvements in cognitive tests at age 7 and remained significant throughout the schooling years, up to age 16. The effects on socialization appear to be more mixed, with adverse behavioural effects from parental reports at age 7 persisting. In adulthood, pre-compulsory schooling was found to increase the probability of obtaining qualifications and to be employed at 33.

Based on a sample of 8,500 children with additional information merged in from a census of all preschool institutions, Cleveland and Krashinsky (1998) also separately assess the effects of preschool education on cognitive and behavioural development at age 5 and 10 of several different types of ordinary preschool programmes. Based on 'analyses of variance' controlling for a number of important socio-economic and family factors, they find that preschool generally boosts cognitive attainment at ages 5 and 10. In terms of problem behaviour, preschool attendance was found to have no effect at age 5 but to increase some types of behavioural problems at 10, in particular conduct disorder, although the latter associations were relatively weak. The study also found weak evidence for the benefits of nursery education being slightly greater for socially disadvantaged children, although this difference was

small compared to the general benefit of preschool for all children.

In the same country, UK, Sammons et al. (2003) conducted a large-scale study following children (2-year-olds or more) attending preschool. At school entry they have better cognitive outcomes (pre-reading, early number, and language) and superior social and behavioural skills than their peers without preschool experiences; longer preschool attendance leads to higher cognitive gains when entering school; and the cognitive gains of attending preschool are larger for disadvantaged children. Additionally, Claessens et al. (2006) tested how school age skills are related to both the achievement and non-cognitive skills that children bring to kindergarten. The study used sample data from Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) for children who were in kindergarten in 1998 and 1999. From the OLS regression result, children's skill in math, reading and attention skills at entry of kindergarten are not predictive of subsequent math achievements. Similarly, socio-emotional skills except attention skill are not predictive of fifth grade math and reading skills. As the theoretical argument, it is found that the gains in reading and math scores in the years of pre-primary education are indicative of future reading and math achievements. In the same way, Carneiro, Crawford and Goodman (2006) investigated the determinants and consequences of cognitive skills and social adjustment of children in Britain, which is one part of non-cognitive skill. In the study, cognitive and non-cognitive skill is analyzed at age 7 and 11 of the children. The standardized test score in maths, reading, copying and drawing, are used to measure cognitive skill. The result showed that children from professional and managerial social classes have higher cognitive and non-cognitive skills at age 7. Moreover, the parents education, the interest of parents in their children education and how much the parents reads also have positive contribution to the development of cognitive skills.

However, unlike the above effects, research findings from Canada report negligible effects. Lefebvre et al. (2000) investigate the relationship between child care arrangements and developmental outcomes of young children using data from Cycle 1 of the Canadian National Longitudinal Survey of Children and Youth. Models of the determinants of Motor and Social Development (MSD) scores for children aged 0-47 months, and of the Peabody Picture Vocabulary Test assessment scores (PPVT-R) for children aged 4-5 years are estimated controlling for a variety of non-parental

childcare and early education characteristics. The results suggest that infant-toddler non-parental care arrangements have insignificant or negligible impacts on developmental outcomes (MSD). For pre-schoolers, modes of care and early education do not, on average, influence cognitive development (PPVT). The results of fixed effect estimates for a sample of siblings aged 0-47 months confirm the preceding conclusion. The analysis is repeated to identify the determinants of the probability the child's MSD (PPVT) score is in the bottom part of the distribution of MSD (PPVT) scores and the conclusions are similar.

Passing to other country's experience, we get New Zealand. Based on longitudinal study of the Competent Children Project, Wylie et al. (2003) analyse the effect of early childhood educational experiences on cognitive, social, communication, and problem solving competencies. The study also examined the effect of family resources, home activities, and engagement in school on these same items. To do so, since 1993, the researchers have collected developmental data on over 500 children and the children are assessed when they are 12 and 14 years of age. Results from the study indicate that starting age of early childhood education was significant in affecting cognitive skills. Children who started before age 2 had higher scores in mathematics, curiosity and reading comprehension. Additionally, parental education levels and family income affected children's literacy and mathematic scores positively. A study in Nepal (2001) also showed that investing in early childhood resulted in halving the dropout rate and grade repetitions reduced to less than one fifth of the former rate. In Brazil, there were dramatic increases in grade completion rate, from 2% to 40% as a result of a community-based early childhood programme. A programme in Brazil that focuses on including children in good quality programmes points out that a child in preschool costs no more than \$ 100, a child on the street costs \$ 200 and a child in the penal system \$ 1000. By improving children's chances of success in school, early childhood education, has the potential of addressing disadvantage squarely.

A well-known study from Jamaica shows that children randomly assigned to receive home-based early stimulation have substantial improvements in cognitive development and subsequent school performance (Powell et al. 2004). Similarly, in Argentina, Using methods of intention-to-treat and treatment-on-the-treated effect, Berlinski et al. (2009) found that expansion of supply of preschool education has

increased the attendance of preschool education and showed positive effect on the cognitive scores and non-cognitive skills. Meaning, preschool education has increased the score of the students and improved classroom attention, effort, discipline and participation. In fact, for the same country, developing within household estimator and instrumenting preschool attendance by locality of residence and birth group, (Berlinski et al. (2008) also show that preschool attendance has positive impact on the children's completion years of primary and secondary education, accompanied by low dropout and repetition rate in each grade for the treated compared to untreated children.

When come to Africa, related research activities are very scant. Very few studies have been conducted to assess the effects of preschool attendance on cognitive development of children. For instance, Peter Glick et al. (2007) estimate the determinants of cognitive ability among 14 to 17 year olds in Senegal. Unlike standard school-based samples, tests were administered to current students as well as to children no longer or never enrolled. Result of the study indicates that years of schooling strongly affects cognitive skills, but conditional on years of school, parental education and household wealth, as well as local public school quality, have surprisingly modest effects on test performance. Instead, family background primarily affects skills indirectly through its impacts on years of schooling. Therefore closing the schooling gaps between poor and wealthy children will also close most of the gap in cognitive skills between these groups.

Crossing from western Africa to the east of the continent, we find a study conducted by Malmberg et al. (2011), within the context of East-African preschool policy; they investigate the effects of the Madrasa Resource Centre (MRC), a child-cantered intervention program, on East-African (Kenya, Zanzibar, and Uganda) preschool children's cognitive development. Altogether 321 children (153 non-interventions and 168 interventions) participated in a cross-sequential study over three time-points during preschool (mean ages 4.3, 6.0, and 7.1 years). A multilevel model (MLM; time-points nested within children nested within schools), in which time was coded flexibly (i.e., child's age operationalized as months from start of the intervention), showed a beneficial curvilinear effect of the intervention program on children's cognitive gains. A moderation analysis suggested that the effect of observed preschool quality (ECERS) was stronger in the intervention program.

Coming to the target country, Ethiopia, as far as our knowledge, very few studies have been conducted related to the early childhood education. Using the Young Lives Longitudinal data, Woldehanna et al. (2008) estimate correlates of preschool enrolment for the 5-year-old children from a probit model. The findings of this study indicate that while parents' educational level, Muslim households and long-term health problems have positive and statistically significant association with the probability of a child being enrolled in preschool, sibling order is found to have negative association. Yet, no statistically significant association is found for two other independent variables, namely child's gender and wealth index of household in Round 1. Beyond this simple correlates, there are no studies that highlight the effects of early childhood education on cognitive development and subsequent school participation in Ethiopia. As the result, our empirical review of the sector is limited only to this simple correlates estimation. Nevertheless, before we proceed to the empirics of question, we still find it imperative to examine the general trend and structure of the Ethiopian early childhood education sector for data acquired from the Ministry of Education (MoE).

In summary our review of literature reveals that early childhood education among other investments such as early childhood nutrition and care is an investment with a good return in the future. Early childhood education increases the cognitive outcome of children and makes them ready to receive well when they enter primary education. The return to such investment would be even higher for children from lower socio-economic background. Many of the Ethiopian children are disadvantaged in the sense that their socio-economic background is very low stunted (MoFED, 2008): more than 40% of the Ethiopian children are stunted, and 38% of the Ethiopian children are living with parents living in absolute poverty and unable to consume sufficient calories required to perform normal activity. Given this situation, preschool education could result a huge benefit to children in improving their cognitive development.

2.3 An Overview of Early Childhood Education in Ethiopia

Formally, compulsory education in Ethiopia starts at age seven in primary schools. Nevertheless, children can join pre-primary schools between age three to six depending on the availability of the program in their areas. As it is already explained in section one, early childhood education is structured in the form of kindergartens and predominantly provided by the private sector, Non-Governmental Organizations (NGO), communities and faith-based organizations. The government has very limited intervention on this regard. To be precise, in its 2007 report, the Ministry of Education (MOE) states that the government does not run preschool education program essentially for two main reasons. While one explanation, as stated in the document, is to enhance the involvement of the private sector in the education sector, the second justification is to maximize the government's effort in the other levels of the sector. As a result of this government's limited intervention, enrolment rate for preschool education has remained very low and especially absent in most rural areas of the country.

In light of this fact, this subsection provides an overview of the general trends of early childhood education in Ethiopia. To do so, Table 2.1 depicts gross enrolment rates by gender, preschool population, enrolment by level, and number of kindergartens across time in the country. For instance, in 2008/09, out of the estimated 6.95 million children of the appropriate age group, only about 4.2 per cent of the children have been reported to have access to pre-primary education in 2904 kindergarten sites all over the country.

In fact, when we examine Table 2.1 critically, though enrolment is small when compared to the relevant age group, it has been growing since 2003/04 at an average of about 17.5% per year for five years. For this reason, we see that Gross Enrolment Rate (defined as the percentage of total number of children in kindergarten, irrespective of age, out of total population of relevant age groups) for kindergarten in 2008/09 was 4.2% which is 0.3% higher than its previous year. Similarly, given the small number of kindergartens, the number of kindergartens has shown an increasing trend from year to year. For example in 2000/01, there were only 964 kindergartens. But, in 2008/09, this number has jumped to 2,904 with average annual growth rate of 23.02 %. This comparative rise in number of

preschool indicates an ever increasing involvement of the private sector in this stage of education as the government has done nothing at this level of education.

Table 2.1: Trend of Early Childhood Education in Ethiopia

Year	Gross enrolment rate (%)			Number of kindergartens
	Boys	Girls	Total	
2000/1	2	2	2	964
2001/2	2.1	2	2.1	1189
2002/3	2	2	2	1067
2003/4	2.2	2.1	2.2	1244
2004/5	2.4	2.3	2.3	1497
2005/6	2.8	2.6	2.7	1794
2006/7	3.2	3.1	3.1	2313
2007/8	3.9	3.9	3.9	2740
2008/9	4.2	4.2	4.2	2904

Source: Author's compilation based on MOE 2001 to 2009 statistical abstract

Despite the increasing trend of the enrolment rate at the national level, regional and residence (urban versus rural) differences remain significant. In actual fact in a country as large and diverse as Ethiopia, differences among regions and residence are to be expected, but the difference is big enough to require special emphasis. Given such wide disparity, the national average of early childhood gross enrolment ratio is to some extent deceiving. As we can see from Table 2.2, with the exception of Addis Ababa, enrolment rate of children of the relevant age group has remained to be at its lowest stage. In Addis Ababa, for instance, enrolment rate has shown an impressive improvement from about 36% in 2001/02 to 47% in 2006/07 and further to 73.8% in 2008/09. Next to the capital city, enrolment rate in Harari and Dire Dawa is higher compared to the other areas. However, for all the remaining regions (Tigray, Afar, Amhara, Oromiya, Somali, Benishangul-Gumuz, SNNPR and Gambella) enrolment rates were less than the national average gross enrolment rate over the years 2000/01 to 2008/09. Especially, for the two previously most underserved regions, Afar and Somali, the preschool gross enrolment rate has never been above 0.6%. The basic reason for the low preschool attainments in these two regions is the fact that most of the people in those regions are pastoral and semi-pastoral communities in which community of the regions are highly movable from one place to another across seasons in a year.

Generally, despite the fact that the government has been doing little in this critical stage of education, the gross enrolment rate of the subsector has been growing since 2004/05 at approximately 17.5% per year. However, this enrolment growth is basically owing to the involvement of the private sector, mainly in urban parts of the country. For instance, it is apparent to see that large share of the gross enrolment rates are taken by Addis Ababa, Harari and Dire Dawa, which are dominantly urban areas. At the same time the Ministry of Education (MoE, 2008/09) reports that in urban areas of the country, there is a large increase in parents' desires to have their children attend Kindergartens. All those points, directly or indirectly, indicate that there is no as such expansion of early childhood education in rural areas of the country. That is why we have limited the scope of the study mainly to urban areas of the country. However, hope is given that the implication of the urban results will serve for relevant educational policy insight for the whole country with respect to this fundamental stage of education.

Table 2.2: Gross enrolment rate (%) across regions and overt time

Regions	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9
Tigray	2.2	2.1	2.0	2.1	2.2	2.1	2.3	1.0	1.0
Afar	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.6
Amhara	1.3	1.2	1.2	1.3	1.4	1.3	1.5	2.0	2.2
Oromiya	1.4	1.4	1.4	1.7	1.6	1.8	2.3	3.0	3.4
Somalia	0.3	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6
B.Gumuz	1.8	1.9	1.8	2.9	2.8	2.7	3.9	3.4	3.7
SNNPR	1.5	1.5	1.5	1.6	2.0	2.7	2.6	3.0	3.5
Gambella	0.8	1.1	1.1	1.0	3.7	1.4	0.7	3.1	2.4
Harari	12	8.6	7.9	7.2	6.6	6.1	11.0	12.6	11.4
Addis Ababa	35.7	36.4	33.1	31.6	32.9	40.3	46.7	74.9	73.8
Dire Dawa	9.7	10	9.1	11.6	10.6	3.5	7.9	10.7	19.7
Total	2.0	2.1	2.0	2.2	2.3	2.7	3.1	3.9	4.2

Source: Author's compilation based on MOE 2001 to 2008 statistical abstract

3. Methodology

3.1 Data Source and Measurements

The data used for the empirical analysis come from the Young Lives Longitudinal Survey in Ethiopia, which is part of the international project tracking the livelihoods of children in Peru, Vietnam, and the state of Andhra Pradesh (India). This longitudinal survey was conducted in two phases. While the first phase took place in 2002, the second phase was administered in 2006/07. In these two phases of data collection, the targeted children were six to 18 months old and 4.5 to 5.5 years old, respectively. These children are found in 20 sites (communities) of the five big regions of the country where more than 96% of the Ethiopian children live. In line with the focus on child poverty, there was an emphasis on poor rural and urban sites during the sampling. Between the two rounds, there was an attrition rate of 1.33%, which is low compared with other longitudinal studies (Woldehanna, 2008). Furthermore, the data covers a comprehensive range of topics including information on children's and their families' access to key services (education and health), work patterns and social relationships, as well as core economic indicators such as assets.

What we are looking for is to understand the degree of association between preschool enrolment (between ages three and five) and cognitive development test scores measured in round 2 (at the age of five). During the round-two survey, each parent was asked if the child was enrolled in preschool education when she or he was three years old. Then in round two cognitive development outcome was measured when children were at around the age of five (in round 2) using Peabody Picture Vocabulary Test (PPVT) and Cognitive Development Assessment – Quantity (CDA-Q) Test. While the former is a test of vocabulary recognition that has been widely used as a general measure of cognitive achievement, the latter is a common test used in assessing cognitive development of young children. More precisely, PPVT is a test of receptive vocabulary adaptable according to age. In PPVT test, a child hears a word ('boat', 'lamp', 'cow', 'goat' etc) and is then asked to identify which of four figures corresponds with the spoken word. After the test was administered, the PPVT score was built based on the datasets provided by Young Lives Study. Likewise, CDA-Q test which essentially measures children's understanding of quantity-related concepts was built by Young Lives Study. (see Cueto et al., 2009).

Additionally, to achieve better measures of the cognitive development, the raw score tests were adjusted in to standardized scores. For instance, the PPVT raw scores were adjusted in order to corrected PPVT raw score, This is undertaken by correcting errors in test administration e.g. (1) eliminating items above the ceiling that could not be administered; (2) taking the highest item reached by the child; and (3) subtracting lower items that were answered incorrectly and also lower items with poor statistical behaviour. In the same manner, corrected raw score of Cognitive Developmental Assessment (CDA) test was developed by Young Lives Study (Cueto et al., 2009). Except items eliminated due to poor statistical behaviour, the score was built as the sum of all items (1 for correct, 0 for blank or incorrect). In fact, to make language-comparable, both PPVT and CDA-Q test raw scores were further standardized by language spoken as there was language diversity in undertaking the longitudinal survey across the country. In short, to materialize the objectives of this study, alternative forms of PPVT and CDA-Q tests were developed as proxy measures of cognitive development of preschool (five-years-old) children from the second round survey.

3.2 Econometric Model Estimation

We start by specifying cognitive development, measured by PPVT or CDA-Q test scores, to be a function of the child's preschool education attendance, and a set of child and household characteristics that mainly influence those test scores. In other words, although our main interest is to evaluate the effects of early childhood education on cognitive development outcomes, we must acknowledge the fact that those outcomes are greatly subjected to various factors beyond early childhood education. For this reason, we introduce a set of socioeconomic control variables to improve the robustness of the results. For instance, nutritional status of early childhood is one of the most important determinants of cognitive development and achievement in subsequent schools. To do so, we have included, Z-score of height-for-age, measured at round one of the longitudinal survey. The key insight is that a child's learning productivity at preschool seems to be partially determined by parental investments in health and nutrition during infancy. To fix the idea, Vector X in equation (1) includes: (a) nutritional status of children in round one; (b) wealth index of household in round 1; (c) household demographic composition and dependency ratio in round 1. Indeed, community-fixed effects are also included to reduce bias from characteristics common to children within the same community.

Accordingly, the basis of our estimation strategy can be summarized by the following education production function.

$$\text{Log}(Y_{ij}) = \beta_j + \beta X_{1ij} + \beta_{2i} Z_{ij} + U_{ij} \quad (1)$$

where Y_i is child i 's cognitive development, measured by the test score of interest, living in community j ; X_{ij} is a dummy variable whether child ' i ' is enrolled in preschool or kindergarten school (KG) at age three or above, Z_i is other (confounding) factors affecting child ' i ' cognitive development since birth, which basically include, as stated above, nutritional status, household composition, wealth and child characteristics; β_j is a community fixed effect; and U_i is a disturbance term

However, estimating equation (1) by ordinary least squares (OLS) is likely to lead to biased estimates of the parameters of interest as many of the inputs we consider are possibly correlated with household unobservable characteristics such as household or child specific effect and to other factors of early childhood experiences. Also, no matter how comprehensive our list of inputs, it is possible that there are omitted terms in equation (1). All of these considerations give rise to serious concerns about the exogeneity of the input measures; that is there are good reasons to suspect that some of the explanatory variables specifically preschool enrolment is correlated with the error term. For instance, given the above equation, preschool education attendance is highly influenced by parents' preference for child quality. Such kind of preference makes preschool education attendance to be interpreted as a parent's and/or community's characteristics. Hence preschool attendance should not be included as an exogenous variable, as it is clearly endogenous variable in many ways. This endogeneity, $E(x_{ij}, U_{ij}) \neq 0$, makes OLS estimates biased, which indeed needs instrumental variables. The same is also true for nutritional status as it could be endogenous variable in the specified model. Hence, in order to deal with this problem we need to impose further assumptions to equation (1). In particular, we will assume that

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (2)$$

where (V_{it}) captures child and household specific unobserved factors and ε_{ij} is white noise.

Equation (2) really indicates that we have to use instrumental variable (IV) estimation method where we have to obtain valid instruments for the suspected endogenous variables. Although it is hard to find relevant and valid instruments for a given endogenous variable, there are two conditions to be satisfied for the instruments to be appropriate. First, the instruments must be relevant (strongly correlated with the endogenous variable), which is testable via first-stage F tests. Second, instruments must be valid (uncorrelated with the error terms), conditional on other explanatory variables which could be verified by the specification test or test of over identification provided we have more than two instruments for one endogenous variable. Hence, based on these criteria, we have chosen community dummies for preschool enrolment and pre and post natal shocks that affects household welfare negatively for nutritional status. We tried to use distance to preschools as instrument for Preschool enrolment, but it is insignificantly correlated with the enrolment in preschool due to lack of variation within the sample.

Hence, for the IV or two-stage least squares (2SLS) estimation, the first-stage (reduced form) equations are stated as:

$$KG_{ij} = B_1 CD_j + Shocks_{ij} + B_3 X_{ij} + \alpha_{2j} + \varepsilon_{ij}. \quad (3)$$

where CD cluster dummies and Shocks are pre and post natal shocks that affects the household welfare negatively. Similarly, for other endogenous variable it becomes.

$$Z-HFAR1_{ij} = \gamma_1 Shocks_{ij} + \gamma_2 CD_j + \gamma_3 X_{ij} + \alpha_{2j} + \varepsilon_{ij} \quad (4),$$

where $Z-HFAR1_{ij}$ is z-score of height for age in round 1.

Following these estimations, two-stage-least squares (2SLS) estimates are estimated using generalized method of moment (GMM) with standard errors computed after adjusting for the general form of heteroscedasticity, or robust standard errors adjusted for the clustering of data at the community level and with additional correction for the two-stage estimation process.

Moreover, we have used alternative instrumental variable estimation method known as Wooldridge approach in which propensity score or predicted probability of

preschool enrolment is used as an instrument for preschool enrolment (Wooldridge (2002, p.623). In this case we first run a probit model of preschool enrolment where cluster/site dummies and pre and post natal shocks as well as other factors that affect the cognitive outcome are included. Then we predicted the probability of preschool enrolment propensity score of preschool enrolment. In the second stage regression, we used the predicted probability of preschool enrolment as instrument for preschool while we exclude cluster/site dummies and pre and post natal shocks in order to identify the parameters. According to Wooldridge (2002, p.623), this estimator provides efficient estimates. In both instrumental variable estimations, we tested the relevance via first-stage F tests and validity of instruments via Hansen J test or over identification test.

In both the OLS and IV estimation methods, the explanatory variables used to explain cognitive outcome of children at the age of five are preschool enrolment, Z-score of height for age at the age of one, age of the child in months during round one survey, sex of the child (male dummy), wealth index in round one, household composition, highest grade completed by caregiver and father of the child, number of months the child breastfed, birth weight measured by five point Likert scale for the relative size of birth weight (-2 to 2), and dummy for child had health problems at the age of one year. Among these explanatory variables, as discussed above, preschool enrolment and Z-score of height for age at the age of one are the endogenous variables. In the standard IV estimation, urban site dummies and pre-natal and post-natal shocks that affect household welfare negatively are used as instrumental variables for preschool enrolment and Z-score of height for age. In the Wooldridge IV estimation, the predicted probability of preschool enrolment obtained from the propensity score estimation for the matching regression is used as instrument for preschool enrolment.

3.3 Propensity Score Matching

The accuracy of estimating impact of pre-school attendance on cognitive development of children from an econometric model largely depends on the availability of instruments that satisfy relevance and validity conditions. Since it is very difficult to test appropriate so as to ensure validity of instruments used for pre-school attendance, we also used propensity score matching techniques to assess the

impact of pre-school on cognitive development and substantiate the OLS and IV estimation results.

If we want to infer causality, selecting an appropriate comparison group through propensity score matching also offers an alternative way to obtain comparable results and (compared to OLS and IV), which requires some assumptions about the “correct” functional form. The matching assumptions ensure that the only remaining relevant difference between the two groups is program participation (preschool education attendance, in this case) provided that the differences can be captured by the observables and there is no individual effect. However, since we have a lot of observables including what happened to mothers and the households before the birth of child and the child and household characteristics before the child was enrolled in preschool. Therefore, we can capture much of the differences among the children and hence we can match the treated (preschool attendee with the untreated (non-preschool children) in a better way than many studies relying on cross-section data sets. The propensity score analysis proceeds in two steps. First, we estimate a propensity score for each individual as the conditional probability (from a probit model) of attending kindergarten given the full set of covariates. The propensity score is next used to create a matched control group of children who did not attend preschool education. We use Kernel matching method and limit the sample to children for whom there is sufficient overlap in propensity scores between the kindergarten and comparison group (the area of common support). The robustness of the results was checked by using other matching techniques such as nearest neighbourhood matching, radius matching and one-to-one matching. If the matching process proceeds correctly, the treatment and control children will have similar measured characteristics and the effects of preschool education can be estimated by comparing the matched groups’ means. That is, the average treatment effect on the treated (ATT), which is calculated as

$$ATT \equiv E(CD_{i1} - CD_{i0} | d_i = 1) \quad (6)$$

Where d_i is preschool enrolment dummy which is 1 if enrolled in preschool education and 0 otherwise, CD_{i1} and CD_{i0} are cognitive outcomes, with CD_{i1} the score of outcome that would be observed if the child attended preschool education and CD_{i0} the outcome score observed on the same age if the child did not attend preschool education. Child’s participation equation is specified as

$$d_i = \alpha_1 X + \varepsilon_i \quad (7)$$

Where d is dummy variable for a child's participation in preschool, while X are variables that affect both the participation in pre-school and cognitive development outcomes.

Implementing matching requires choosing a set of variables covariates, x , that credibly satisfy the condition that the outcome variable (cognitive development in our case) must be independent of treatment (pre-school enrolment) conditional on the propensity score. Heckman, Ichimura, and Todd (1997) also show that omitting important variables can seriously increase bias in resulting estimates. Moreover, there is no guideline on how to choose conditioning variables, x , (Smith and Todd, 2005), hence selection of x variables intuitively is very important and hence these covariate must include variables that affect both the outcome and the participation in programs. Smith and Todd (2005) or Sianesi (2004) advised to have a deeper knowledge of setup of the program (in our case) pre-school education is important in order to select variables to be included in the probit model of propensity score.

In the estimation of propensity score of preschool enrolment, the explanatory variables used are those that affect both the preschool enrolment (participation of children in preschool) and the cognitive outcomes. These variables include urban site dummies (one site in Addis Ababa a comparison group), pre-natal and post-natal economic shocks that affect household welfare negatively, Z-score of height for age at the age of one, age of the child in months during round one survey, sex of the child (male dummy), wealth index in round one, household composition, highest grade completed by caregiver and father of the child, number of months the child breastfed, birth weight measured by five point Likert scale for the relative size of birth weight (-2 to 2), and dummy for child had health problems at the age of one year. It is the predicted probability of preschool enrolment from this model that we use as instrumental variable for preschool in the estimation of Wooldridge IV.

4. Descriptive Statistics

Although we have presented the general trend of the of early childhood education in previous sections using secondary data acquired from the Ministry of Education,

before we proceed to the estimation part, it is equally important to reconsider the pattern of preschool education directly from the Young Lives Longitudinal Data. Accordingly, Table 4.1 presents summary statistics of key variables. Out of 1912 preschool age children included in the survey, 762 are from urban areas while the rest 1150 are from rural part of the country. With respect to kindergarten enrolment, 57% of the urban preschool age children have been enrolled in kindergarten since the age of three or four. However, this participation rate is overestimated due to exclusion of the rural areas. If we have a close look at the rural children, only 3% of them have been attending preschool education. This implies that out of total sample of 1912 preschool age children, only 25% of them have been attending preschool education in the country. This obviously indicates preschool is an urban experience in Ethiopia. Off course, even in the urban areas, as it is predominantly provided by the private sector, it is unequally distributed. This means that only some privileged children have access to this fundamental stage of education. For instance, if we look for an issue -who runs the preschool, out of the total enrolled children, 71.10% of them have been attending their early childhood education in private kindergarten, whereas the rest 28.90% have been attending their education in kindergartens owned by community, public and others. This clearly indicates that the subsector is dominated by fee charging kindergartens in which children from socio economic disadvantaged background do have only little opportunity to attend this first and critical stage of education. In light of this fact, since the opportunity to attend preschool is almost entirely restricted to urban children and privileged ones, the analyses of this study, mainly represent for the urban areas of the country.

Coming to the cognitive outcomes, Table 4.2 reports various outcomes: PPVT, CDA-Q test scores, these test scores adjusted for language difference among children, log of PPVT, log of PPVT standardized by language; log of CDA-Q test; log of CDA-Q test adjusted for language differences. In all measures children enrolled in preschool education scored higher than those who did not enrol in preschool. We will see later if this difference in cognitive development test score persists when we control of other factors and compare the preschool enrolled children with matched non-preschool children.

Table 4.1: .Summary statistics of test scores and household characteristics for urban children

	N	Mean	S.D.	Min	Max
Raw score of PPVT test in round 2	739	26.79	14.85	3.00	121.00
Logarithm of PPVT test score in round 2	739	3.17	0.47	1.10	4.80
Standardized core of PPVT test in round 2	741	76.25	21.14	40.00	160.00
Logarithm of Standardized score of PPVT test in round 2	741	4.30	0.26	3.69	5.08
Raw score in the CDA test in round 2	742	9.44	2.73	0.00	14.00
Logarithm of Raw score in the CDA test in round 2	740	2.20	0.35	0.69	2.64
% of math questions correctly answered in round 2	742	62.93	18.21	0.00	93.33
Logarithm of % of math questions correctly answered in round 2	740	4.09	0.35	2.59	4.54
Raw score in the PPVT test standardized by language in round 2	497	318.10	50.20	193.10	519.00
Raw score in the CDA test standardized by language in round 2	658	315.30	48.20	115.30	471.60
Logarithm of Raw score in the PPVT test in round 2 standardized by language	498	5.75	0.15	5.26	6.25
Logarithm of Raw score in the CDA test standardized by language in round 2	658	5.74	0.16	4.75	6.16
Dummy variable for child being enrolled in preschool	745	0.57	0.50	0.00	1.00
Z-score of height-for-age at the age of one year	725	-0.94	1.77	-6.04	8.17
age of child in month in round 1	745	12.33	3.58	6.10	18.23
Wealth index for 1-year-olds (Round 1)	745	0.33	0.15	0.01	0.76
Dummy for male	745	0.52	0.50	0.00	1.00
Number of children below 7 and above 65 years old	745	1.52	0.70	1.00	5.00
Number of children between 7 and 17 years old	745	1.30	1.34	0.00	8.00
Number of male family members > 17 and less than 65 years	745	1.17	0.82	0.00	5.00
Number of female family members > 17 and less than 65 years	745	1.41	0.82	0.00	6.00
What is the highest grade completed by primary caregiver?	745	4.98	4.30	0.00	14.00
What is the highest grade completed by father?	745	6.59	4.75	0.00	14.00
Number of months a child was breastfeed	745	28.94	13.52	0.00	36.00
Five point Likert scale for the relative size of child when	745	0.06	1.07	-2.00	2.00
Dummy for child had health problems at the age of one year	745	0.43	0.50	0.00	1.00

With respect to nutritional status, the mean values for rural and urban children are 1.46 and 0.95 below the standard deviation of the median's Z-score height –for age, respectively. Here, height for age represents the long term effect of malnutrition. This indicator is sometimes described as the nutrition poverty height. The standard

for WHO (international standard) is that any child with $-2Z$ (below) is stunted in terms of height and are said to be chronically malnourished. Accordingly, though the mean of Z scores are a bit above -2 , this does not mean that most of the children are not stunted. For instance, the minimum combined average of the two residences is rather about 7.68 below the median's Z-score height –for age with that standard deviation of 1.96. This indicates that there is wide spread of severe malnutrition among the preschool age children in both rural and urban part of the country. Similarly, concerning the demographic composition of the sample, the sex ratio of the sample is a bit taken by male to the extent of 53%. It is also apparent to see that the visited communities are dominated by high dependency ratio. For instance, the mean values for the number of children below 7 and above 65 years old are 1.70 and 1.52 for rural and urban areas, respectively. This indicates that there is high ratio of dependents to the active force in each household of the visited communities.

Table 4.2. Test score for five years old children by preschool attendance

	Non preschool children	Preschool children
Raw score in the PPVT test	21.9	30.9
Raw score in the CDA test	8.3	10.4
standardize score in the CDA test by language spoken	297.6	326.5
standardize score in the PPVT test by language spoken	288.2	327.3

5. Estimation Results

5.1 OLS and IV Estimates

Because of the absence of preschools in many rural areas of Ethiopia, number of rural children enrolled in preschool are very few and hence we are obliged to estimate preschool enrolment model only for urban areas. Accordingly, Table 5.1 presents the estimated results from the basic OLS and instrumental variable estimation methods where the cognitive development score is unadjusted and adjusted for mother tong language differences among children. The explanatory variables used to explain cognitive outcome of children at the age of five are preschool enrolment, Z-score of height for age at the age of one, age of the child in months during round one survey, sex of the child (male dummy), wealth index in round one, household composition, highest grade completed by caregiver and father

of the child, number of months the child breastfed, birth weight measured by five point Likert scale for the relative size of birth weight (-2 to 2), and dummy for child had health problems at the age of one year.

All estimates including OLS, standard IV estimates and Wooldridge IV estimates show that preschool attendance is positively and strongly associated with the cognitive scores though OLS provides lower estimates compared to the IV estimates. The IV estimates always have the same sign but are much larger than the corresponding OLS estimates. We know OLS is not an efficient estimator if we have endogenous variables in our model. While the Wooldridge IV estimator is a more efficient estimator, there is no way of testing for mis-specification or overidentification because we have only one instrument. The overidentification test suggests that the IV estimates where preschool is the only endogenous variable have specification problem hence we do not use these for interpretation of the results. We have reasonably better estimates in the standard IV estimates where both preschool enrolment and nutritional status of children are endogenous because it satisfies the relevance (based on first stage regression) and validity (based on overidentification test) tests (see Tables A5.4a, A5.4b).

More specifically in the Wooldridge IV estimates, *ceteris paribus*, five years-old-children who have attended preschool education scored 21.6% higher in PPVT and 15% higher in language adjusted PPVT than the non-preschool attendees of the same age. Similarly, five years-old-children who have attended preschool education scored 23.4% higher in cognitive development assessment - quantitative test- CDA-Q test and 6.5 % higher in language adjusted CDA-Q test than those who did not attend -preschool education of the same age.

The magnitude of the association is only slightly higher in the estimates of standard IV version where both preschool enrolment and nutritional status are endogenous. The other IV estimate where only preschool is endogenous is not much different either from other IV estimates indicating the robustness of the results. In all estimations, the association declines when the cognitive development test scores are adjusted for language differences perhaps because many of the differences in cognitive differences among children is due to relationship between test score and language used to administer the test.

It is important to mention the associations between cognitive outcomes of children and other confounding factors provided in Tables A5.4a and A5.4b in the appendix. In all the estimation methods discussed so far, we found household wealth and parents education (including the education level of both the father and the caregivers) to have strong association with cognitive development outcome measured by PPVT and CDA-Q test scores. With respect to nutritional status of children at age one, we found nutritional status is positively associated with test score measured by PPVT and CDA-Q test scores. This indicates that early nutrition status is an important correlate of subsequent cognitive development. However, such correlations become very weak and less statistically significant when the cognitive outcomes are adjusted for language. Tables A5.4a and A5.4b show the gender differential in cognitive development. In all estimation methods, we found that there is higher association between preschool attendance and cognitive development for girls than for boys. However, the association is only statistically significant in the IV estimates where both preschool and Z-score of height for age are endogenous indicating that unexplained gender differential cognitive outcome it is not robust. Moreover, it is apparent to see that there is no statistically significant association between demographic variables or household composition and cognitive development outcomes. This may indicate that number and composition of household does not matter for a child's cognitive outcomes in urban areas of the country.

Table 5.1: Summary of IV results on the relationship between preschool attendance and children's cognitive development at the age of five

	Ln (PPVT test score)	Ln (math test score)
Unadjusted for language difference among children		
<i>OLS</i>	0.172***	0.166***
IV - Wooldridge approach - only preschool as endogenous	0.216***	0.234***
IV – only preschool enrolment endogenous	0.318***	0.315***
IV- both preschool enrolment and z-score of height for age endogenous	0.279***	0.276***
Unadjusted for language difference among children		
<i>OLS</i>	0.071***	0.056***
IV - Wooldridge approach –only preschool as endogenous	0.149***	0.065***
IV – only preschool enrolment endogenous	0.212***	0.083***
IV- both preschool enrolment and z-score of height for age endogenous	0.207***	0.075**

note: *** p<0.01, ** p<0.05, * p<0.1; *ATT*= Average treatment effect of the treated ; result of *psmatch2* ; *k*=2 in the *k*-Nearest neighbourhood matching; Ln (PPVT test score) =Logarithm of PPVT test score in round 2; Ln(math test score)=Logarithm of % of math questions correctly answered in round 2; Wooldridge approach – takes propensity score (predicted probability of enrolment in preschool education) as instrument for preschool enrolment

We are aware that finding good (relevant and valid) instrument variables is not that easy though the instruments we have chosen have passed the relevance and validity test (see Tables 5.3b, 5.4a and 5.4b). However, checking the robustness of the results is never an ended 'business'. That is why we still intend to examine the strengths of the discussed results using a propensity score matching estimation approach, which is basically built upon very certain assumptions in demonstrating the differential effects of preschool attendance on cognitive outcomes as compared to the previous models.

5.2 Propensity Score Matching Estimates

The goal of propensity score matching approach is to reproduce the treatment group among the non-treated ones, this way re-establishing the experimental conditions in a no experimental setting (Blundell et al, 2008). In the case of this study, while children who have been attending preschools belong to the treatment group, preschool age children who have not attended preschools are considered as

non-treated group. Accordingly, to examine the differential effects of preschool attendance on the urban children's cognitive scores, we initially estimate propensity scores by running probit regressions of preschool attendance on a set of observed covariates (see Table A5.2 in the Appendix). We then estimate a regression based on Kernel matching technique and extracted only the ATT from the kernel regression results. To see the robustness of the results, we have also computed ATT using nearest neighbourhood, radius and calliper matching. In the kernel matching methods, all treated ones are matched with a weighted average of all controls with weights that are inversely proportional to the distance between propensity scores of treated and controls (Brand et al., 2003). In the analysis, the common support option has been selected; and the region of common support is given by [0.031, 0.998]. Though it is possible to estimate both the average treatment effect across the entire population (ATE) and the average treatment effect on the treated (ATT), we are only confined to the later one as our purpose of employing this technique is only to check the robustness of the previous OLS and IV estimates. The ATT here is the average difference of cognitive scores between the preschool attendees and the non-preschool attendees of urban preschool age children of the longitudinal data.

Accordingly, we obtain ATT estimates for both PPVT and CDA-Q test scores from the kernels and other matching regressions for all urban children of the sample. In fact, we also obtain cognitive scores separately for boys and girls. Average treatment effects on the treated (ATT) of cognitive scores are summarized in Table 5.2. Kernel matching estimates suggest that there is cognitive achievement advantage from attending early childhood education in the sense that preschool attendance is highly associated with cognitive outcome of children. To see the robustness of the results, we have obtained similar pattern when we use nearest neighbourhood and radius matching techniques (see A5.1 in the appendix). From the kernel matching estimates, we found that children who attended preschool education scored 31.2% higher in PPVT test and 23.1 in CDA-Q test when the test score is not adjusted for language differences. When the test scores are adjusted for language differences, preschool attendees scored 11.6% higher for PPVT test and 11.7% in CDA-Q test indicating gain that some of the association between preschool and cognitive outcome is due to the relationship of the tests to languages children speak. The result we obtain from the propensity score matching is much closer to IV estimates indicating the robustness of our results.

The sign or direction of association between preschool enrolment and cognitive outcomes is the same when we computed the estimate for girls and boys separately, but slight higher association between preschool and cognitive association for girls than for boys explaining the widely accepted result that preschool is more beneficial for girls (Campbell et al. 2002) because they are subject to discrimination by parents.

Table 5.2: Impact of preschool education on children's cognitive development at the age of five (kernel matching result)

	Girls + boys		Girls		Boys	
	ATTk	T-stat	ATTk	T-stat	ATTk	T-stat
Unadjusted for language						
Ln (PPVT test score)	0.312***	9.27	0.410***	6.24	0.307***	4.10
Ln(math test score)	0.231***	8.66	0.253***	4.54	0.233***	4.12
Adjusted for language						
Ln (PPVT test score)	0.116***	8.01	0.126***	6.59	0.100***	4.47
Ln(math test score)	0.117***	6.35	0.110***	5.00	0.103***	4.30

ATTk= Average treatment effect of the treated from kernel matching

If enrolment in pre-school education has a strong impact on cognitive development of children, why some parents fail to send their children to pre-school. The probit model we run to estimate the propensity score helps is to identify some of the factors correlated with parent's failure to send children to pre-school. The probit regression provided in Table A5.2 (in the appendix) indicated that in addition to the location dummies, household wealth and parents level of education are significantly correlated with the probability that a child in urban areas is enrolled in preschool education. This implies that enrolment in preschool is deterred by parents lack of awareness and money to send their children to preschool education. The results also indicate that one way of promoting pre-school education is establish government preschool so that children from poor families can be enrolled. Moreover, the result also imply that creation of awareness on the importance of preschool education to improve children's' cognitive development

6. Concluding Remarks

Using high quality data obtained from the Young Lives Longitudinal survey in Ethiopia, we have examined the associates of early childhood education attendance and cognitive development of preschool age children with particular emphasis on urban part the country. To check the robustness of the results, we employed several regression models including propensity score matching, OLS and instrumental variable estimation methods. Across all these models, though the point estimates change somewhat, the results persistently show that early childhood education attendance is associated with a substantial improvement in children's cognitive development. For instance, in the propensity score matching, children who have been attending preschool education have scored 31.2% higher in PVVT test and 23.1 % in CDA-Q test than those of non-preschool attendees. These figures are 11.6% and 11.7% when the cognitive outcomes are adjusted by language differences among the children. We have similar results in the instrumental variable estimation method: children who have been attending preschool education have scored 21.62% higher in PVVT and 23.4 % in CDA-Q test than those of non-preschool attendees, controlling for other factors. When cognitive outcomes are adjusted language differences among children, preschool education attendants scored 15% higher in PVVT and 6.5 % in CDA-Q test than those of non-preschool attendees.

Despite the evidence that preschool education is important for children's cognitive development, public investment in this critical stage of education is currently very small in the country. The majority of activities in this stage of education are rather left for private sector. As the result, it is obvious to see that the subsector is dominated by fee charging kindergartens in which children from low socioeconomic background do have very little opportunity to attend this fist and critical stage of education. For instance, in numerical terms, while the data from the Young Lives indicates that out of the 1912 total sample, 25% of them attend preschool education, we find a surprising figure for data acquired from the Ministry of Education for the whole country. Out of the 7 million preschool age children, only 4.2% of them attend preschool education. This clearly demonstrates that only some privileged children have an access to this fundamental stage education. Furthermore, though high enrolment rate in primary education is currently recording- to the extent of 94.3% gross enrolment, the sector is generally characterized by high dropout rate, repetition rate and overall quality deterioration.

Therefore, although early childhood education is not a panacea, the obtained results reveal that early education programs can substantially improve the cognitive development, academic success, and lives of children in poverty while benefiting the nation as a whole. Therefore, given this low participation rate and low quality of basic education, the government has to derive some lessons from the empirical analysis. Early childhood education is a key to later achievements in school and life. In view of that, government has to do more in this first and essential stage of education. It is paradoxical to expect that high quality basic education will be genuinely available for all children if the provision of early childhood schemes favours richer households in urban areas and exclude the poor and the marginalized. The government has to be aware that early childhood is a critical window of opportunity that helps break inter-generational transmission of poverty (Siraj-Blatchford, 2009). Investing in young children is one of the wisest investments a nation can make. The reviewed literatures indicate that countries that invest in early childhood education do so not because they have surplus resources but because they appreciate the advantages for children, families, communities and ultimately entire nations. So, the government needs to look at the existing preschool system with new eyes. Government instead of spending huge amount on capacity building of old people it is better to invest on kids who will be more able in the future. At least, by giving equal attention similar to that of primary, secondary and tertiary education, the government needs to establish public preschools for the poor in both rural and urban areas of the country.

Nevertheless, caution should be taken; public intervention in early childhood education does not necessarily imply supply by the public sector alone. In addition to wealth, we have seen parents' education is the key for children to attend in preschool education indicating the importance of awareness on the benefits of preschool school education. Helping stimulate demand by parents for such schemes through media campaigns could be one method of achieving this. Private provision should also be encouraged and incentives must be given to private providers who work mainly with disadvantaged groups.

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Appendix

Table A2.1: Trend of Early childhood Education in Ethiopia

Year	Preschool Age Population			Enrolled pupils		
	Boys	Girls	Total	Boys	Girls	Total
2000/1	2781270	2709148	5490418	55616	53742	109358
2001/2	2934333	2864847	5799180	60809	58177	118986
2002/3	3067799	3000397	6068196	62574	60483	123057
2003/4	3207925	3142895	6350820	71435	67483	138918
2004/5	3355063	3292733	6647796	78884	74396	153280
2005/6	3509595	3450342	6959937	96604	90124	186728
2006/7	3546784	3484337	7031121	112400	106668	219068
2007/8	3439741	3322001	6761742	135122	128342	263464
2008/9	3538728	3418013	6956741	149988	142653	292641

Source: Author's compilation based on MoE 2001 to 2009 statistical abstract

Table A5.1. Impact of preschool education on children's cognitive development at the age of five for both unadjusted and adjusted for mother tongue language differences among children

Method of matching	Type of statistics	Unadjusted for language		Adjusted for language	
		Ln (PPVT test score)	Ln (math test score)	Ln (PPVT test score)	Ln (math test score)
Kernel matching (default, k=5)	ATT	0.312***	0.231***	0.116***	0.117***
	T-ratio	9.27	8.66	8.01	6.35
Radius matching	ATT	0.307***	0.23***	0.114***	0.116***
	T-ratio	9.47	8.91	8.97	7.26
Local linear regression matching	ATT	0.25***	0.158***	0.038	0.045
	T-ratio	3.72	2.72	0.71	0.81
k-Nearest neighbourhood matching (k=2)	ATT	0.13	0.272***	0.092***	0.074***
	T-ratio	1.54	3.79	3.29	4.88
k-Nearest neighbourhood matching (k=1)	ATT	0.152**	0.269***	0.119***	0.080***
	T-ratio	2.63	5.63	3.58	4.52

note: *** p<0.01, ** p<0.05, * p<0.1; ATT= Average treatment effect of the treated; result of *psmatch2* ; k=2 in the k-Nearest neighbourhood matching; Ln (PPVT test score) =Logarithm of PPVT test score in round 2; Ln(math test score)=Logarithm of % of math questions correctly answered in round 2

Table A5.2: First stage probit estimation of preschool

	Coefficient (t-ratio)
Dummy variable for site 2 in Addis Ababa	0.174 (0.476)
Dummy variable for site 3 in Addis Ababa	-0.249 (-0.685)
Dummy variable for urban site in Amhara region	-1.832*** (-5.899)
Dummy variable for urban site in Oromia region	-2.159*** (-6.871)
Dummy variable for urban site 1 in SNNP region	-3.273*** (-8.670)
Dummy variable for urban site 2 in SNNP region	-0.640* (-1.946)
Dummy variable for urban site Tigray region	-2.757*** (-7.661)
Dummy variable for other urban sites (where children moved out of their site)	-1.738*** (-4.863)
Calculated age in months for deriving z scores in round 1	0.037* (1.890)
Wealth index for 1-year-olds (Round 1)	1.743*** (2.828)
Dummy for male	0.030 (0.217)
Number of children below 7 and above 65 years old	-0.155 (-1.623)
Number of children between 7 and 17 years old	-0.051 (-0.988)
Number of male family members > 17 and less than 65 years	-0.048 (-0.510)
Number of female family members > 17 and less than 65 years	0.113 (1.190)
Highest grade completed by primary caregiver	0.059*** (2.912)
Highest grade completed by father	0.065*** (3.717)
Dummy for a child had long term health problem?	-0.342

	Coefficient (t-ratio)
	(-1.207)
Dummy for illness	-0.025
	(-0.168)
Dummy for theft	0.215
	(0.931)
Dummy for increased input prices	0.193
	(1.030)
Dummy for divorce or separation of family	-0.732**
	(-2.408)
Dummy for place employment shutdown or job loss	0.004
	(0.019)
Dummy for decrease in food availability	0.208
	(1.205)
Dummy for job loss/source of income/family enterprise	-0.157
	(-0.814)
Dummy for divorce or separation	0.040
	(0.127)
Dummy for severe illness or injury	-0.052
	(-0.248)
Constant	0.078
	(0.157)
Number of observations	744
Log-Likelihood	-221.04
Adjusted R2	0.565
note: *** p<0.01, ** p<0.05, * p<0.1	

**Table A5.3a. Wooldridge IV estimation of cognitive development on preschool enrolment
(propensity score as instrument-Wooldridge (2002, P.623))**

explanatory variables	Log (PPVT test score)	Log (Q-CDA test score)
	coefficient (t-ratio)	coefficient (t-ratio)
Dummy variable for child being enrolled in preschool	0.216*** (3.822)	0.234*** (5.466)
Z-score of height-for-age at the age of one year	0.013 (1.372)	0.023*** (3.282)
Calculated age in months for deriving z scores in round 1	0.029*** (6.134)	0.016*** (4.625)
Wealth index for 1-year-olds (Round 1)	0.212 (1.573)	0.025 (0.215)
Dummy for male	0.040 (1.273)	0.011 (0.444)
Number of children below 7 and above 65 years old	-0.034* (-1.696)	-0.014 (-0.740)
Number of children between 7 and 17 years old	0.015 (1.336)	-0.001 (-0.065)
Number of male family members > 17 and less than 65 years	-0.010 (-0.471)	-0.004 (-0.259)
Number of female family members > 17 and less than 65 years	-0.009 (-0.399)	-0.009 (-0.535)
Highest grade completed by primary caregiver?	0.018*** (3.761)	0.009** (2.555)
Highest grade completed by father?	0.002 (0.349)	-0.002 (-0.508)
Number of months the child breastfed	-0.000 (-0.181)	0.000 (0.488)
Five point Likert scale for the relative size of birth weight (-2 to 2)	-0.007 (-0.494)	-0.006 (-0.559)
Dummy for child had health problems at the age of one year	-0.052* (-1.665)	-0.008 (-0.339)
Constant	2.603*** (28.609)	1.864*** (22.543)
Number of observations	719	720
Adjusted R ²	0.199	0.139
Centered R ² (r2c)	0.215	0.156
Uncentered R ² (r2c)	0.983	0.979
Under identification test (Kleibergen-Paapr LM statistic) (idstat)	452.038	453.068
P-value for under identification test (idp)	0.000	0.000

note: *** p<0.01, ** p<0.05, * p<0.1

Table. A5.3b. Wooldridge IV estimation of cognitive development adjusted for language on preschool enrolment (propensity score as instrument-Wooldridge (2002, P.623))

explanatory variables	Log(PPVT test score)	Log (Q-CDA test score)
	coefficient (t-ratio)	coefficient (t-ratio)
Dummy variable for child being enrolled in preschool	0.149*** (4.533)	0.065*** (3.172)
Z-score of height-for-age at the age of one year	0.006 (1.600)	0.011*** (3.500)
Calculated age in months for deriving z scores in round 1	0.008*** (4.124)	0.009*** (5.179)
Wealth index for 1-year-olds (Round 1)	0.097* (1.725)	0.072 (1.338)
Dummy for male	0.021* (1.730)	0.009 (0.745)
Number of children below 7 and above 65 years old	-0.008 (-0.999)	-0.010 (-1.103)
Number of children between 7 and 17 years old	0.002 (0.451)	-0.005 (-1.301)
Number of male family members > 17 and less than 65 years	-0.006 (-0.793)	-0.008 (-1.158)
Number of female family members > 17 and less than 65 years	-0.002 (-0.278)	0.002 (0.362)
what is the highest grade completed by primary caregiver?	0.005*** (2.931)	0.005*** (3.027)
Highest grade completed by father?	-0.002 (-1.287)	-0.002 (-1.137)
Number of months the child breastfed	-0.000 (-0.466)	-0.000 (-0.366)
Five point Likert scale for the relative size of birth weight (-2 to 2)	-0.001 (-0.148)	-0.001 (-0.227)
Dummy for child had health problems at the age of one year	-0.026** (-2.046)	-0.008 (-0.702)
Constant	5.515*** (154.014)	5.594*** (151.743)
Number of observations	486	642
Adjusted R ²	0.154	0.127
Centered R ² (r2c)	0.178	0.146
Uncentered R ² (r2c)	0.999	0.999
Under identification test (Kleibergen-Paaprk LM statistic) (idstat)	175.501	363.657
P-value for under identification test (idp)	0.000	0.000
note: *** p<0.01, ** p<0.05, * p<0.1		

Table A5.4a: Regression of log of PPVT test score and cognitive development assessments - quantitative (CDA-Q) test score

	Ln of PPVT test score			Ln of CDA_Q test score (% correctly answered)		
	OLS coef/t	IV version 1 coef/t	IV version 2 coef/t	OLS coef/t	IV version 1 coef/t	IV version 2 coef/t
Dummy variable for child being enrolled in preschool	0.172*** (4.490)	0.318*** (4.863)	0.315*** (3.847)	0.166*** (5.682)	0.279*** (5.373)	0.276*** (3.610)
Z-score of height-for-age at the age of one year	0.014 (1.465)	0.007 (0.778)	0.187*** (2.943)	0.024*** (3.272)	0.017** (2.533)	0.232*** (4.267)
Calculated age in months for deriving z scores in round 1	0.029*** (6.269)	0.027*** (5.797)	0.052*** (4.972)	0.017*** (4.722)	0.015*** (4.326)	0.045*** (4.991)
Wealth index for 1-year-olds (Round 1)	0.246* (1.832)	0.149 (1.131)	-0.050 (-0.275)	0.079 (0.775)	-0.047 (-0.406)	-0.214 (-1.237)
Dummy for male	0.041 (1.290)	0.025 (0.803)	0.107** (2.255)	0.013 (0.547)	0.007 (0.291)	0.090** (2.103)
Number of children below 7 and above 65 years old	-0.037 (-1.608)	-0.036* (-1.790)	-0.023 (-0.847)	-0.018 (-0.999)	-0.022 (-1.171)	0.002 (0.078)
Number of children between 7 and 17 years old	0.015 (1.211)	0.015 (1.304)	-0.003 (-0.207)	-0.002 (-0.166)	-0.004 (-0.473)	-0.026* (-1.821)
Number of male family members > 17 and less than 65 years	-0.010 (-0.495)	-0.005 (-0.232)	-0.048* (-1.793)	-0.004 (-0.229)	-0.000 (-0.009)	-0.047** (-2.248)
Number of female family members > 17 and less than 65 years	-0.006 (-0.288)	-0.008 (-0.332)	-0.009 (-0.359)	-0.003 (-0.215)	-0.011 (-0.728)	-0.010 (-0.447)
Highest grade completed by primary caregiver	0.019*** (4.068)	0.017*** (3.497)	0.013** (2.119)	0.010*** (2.795)	0.009*** (2.662)	0.004 (0.869)
Highest grade completed by father	0.002 (0.533)	-0.001 (-0.137)	-0.002 (-0.394)	-0.000 (-0.123)	-0.001 (-0.419)	-0.003 (-0.728)
Number of months the child was breastfed	-0.000 (-0.322)	0.000 (0.371)	0.000 (0.078)	0.000 (0.228)	0.001 (0.592)	0.001 (0.607)

	Ln of PPVT test score			Ln of CDA_Q test score (% correctly answered)		
	OLS coef/t	IV version 1 coef/t	IV version 2 coef/t	OLS coef/t	IV version 1 coef/t	IV version 2 coef/t
Five point Likert scale for the relative size birth weight (-2 to 2)	-0.008 (-0.537)	-0.006 (-0.426)	-0.038** (-1.962)	-0.008 (-0.686)	-0.010 (-0.907)	-0.033* (-1.859)
Dummy for child had health problems at the age of one year	-0.050 (-1.535)	-0.043 (-1.377)	-0.025 (-0.631)	-0.006 (-0.234)	-0.017 (-0.715)	0.037 (1.040)
Constant	2.607*** (26.289)	2.594*** (28.399)	2.560*** (22.229)	1.869*** (24.653)	1.909*** (23.604)	1.797*** (15.796)
Number of observations (N)	719	719	719	720	720	720
Adjusted R ²	0.200	0.182	-0.196	0.146	0.122	-0.862
Centered R ² (r2c)		0.198	-0.173		0.139	-0.826
Uncentered R ² (r2c)		0.983	0.975		0.979	0.955
Under identification test (Kleibergen-Paaprk LM statistic) (idstat)		264.065	23.262		266.558	24.092
P-value for under identification test (idp)		0.000	0.026		0.000	0.020
Hansen J statistics (over identification test of all instruments) (j)		24.438	11.244		41.265	12.179
P-value for over identification test (jp)		0.018	0.423		0.000	0.350

Note: *** p<0.01, ** p<0.05, * p<0.1; The instruments are regional dummies and pre and post natal shocks. IV version1: only preschool enrolment is endogenous ; IV version 2: both preschool and z-score of height for age are endogenous variables

Table A5.4b: Regression of log of PPVT test score and cognitive development assessment - quantitative (CDA-Q) test score adjusted for language

	Ln of PPVT test score			Ln of CDA_Q test score (% correctly answered)		
	OLS	IV version1	IV version 2	OLS	IV version1	IV version 2
Dummy variable for child being enrolled in preschool	0.071*** (4.225)	0.212*** (5.309)	0.207*** (4.554)	0.056*** (4.035)	0.083*** (3.738)	0.075** (2.099)
Z-score of height-for-age at the age of one year	0.008** (2.162)	0.005 (1.274)	0.009 (0.414)	0.011*** (3.098)	0.010*** (3.328)	0.111*** (4.223)
Calculated age in months for deriving z scores in round 1	0.009*** (4.808)	0.007*** (3.827)	0.008** (2.030)	0.009*** (5.079)	0.009*** (5.775)	0.023*** (5.268)
Wealth index for 1-year-olds (Round 1)	0.139** (2.558)	0.057 (0.996)	0.058 (1.015)	0.078 (1.536)	0.058 (1.105)	-0.016 (-0.188)
Dummy for male	0.026** (2.109)	0.017 (1.359)	0.019 (1.259)	0.009 (0.748)	0.012 (1.052)	0.045** (2.226)
Number of children below 7 and above 65 years old	-0.010 (-1.143)	-0.004 (-0.533)	-0.004 (-0.539)	-0.011 (-1.258)	-0.005 (-0.516)	-0.001 (-0.084)
Number of children between 7 and 17 years old	0.001 (0.221)	0.003 (0.488)	0.002 (0.351)	-0.006 (-1.244)	-0.006 (-1.551)	-0.015** (-2.147)
Number of male family members > 17 and less than 65 years	-0.007 (-0.956)	-0.005 (-0.581)	-0.006 (-0.610)	-0.007 (-1.016)	-0.006 (-0.885)	-0.030*** (-2.850)
Number of female family members > 17 and less than 65 years	0.003 (0.396)	-0.007 (-0.825)	-0.007 (-0.826)	0.003 (0.419)	0.000 (0.039)	0.004 (0.408)
Highest grade completed by primary caregiver	0.006*** (3.392)	0.005*** (2.738)	0.005*** (2.651)	0.005*** (3.061)	0.004*** (2.577)	0.003 (1.112)
Highest grade completed by father	-0.001 (-0.742)	-0.003* (-1.874)	-0.003* (-1.833)	-0.002 (-0.995)	-0.002 (-1.220)	-0.003 (-1.174)
Number of months the child was breastfed	-0.000 (-0.633)	-0.000 (-0.558)	-0.000 (-0.582)	-0.000 (-0.429)	-0.000 (-0.284)	0.000 (0.072)

	Ln of PPVT test score			Ln of CDA_Q test score (% correctly answered)		
	OLS	IV version1	IV version 2	OLS	IV version1	IV version 2
	coef/t	coef/t	coef/t	coef/t	coef/t	coef/t
Five point Likert scale for the relative size birth weight (-2 to 2)	-0.002 (-0.262)	0.001 (0.168)	-0.000 (-0.050)	-0.001 (-0.269)	0.002 (0.454)	-0.022** (-2.112)
Dummy for child had health problems at the age of one year	-0.024* (-1.858)	-0.025** (-1.969)	-0.025* (-1.922)	-0.008 (-0.672)	-0.005 (-0.470)	0.003 (0.158)
Constant	5.538*** (143.235)	5.496*** (144.007)	5.496*** (144.278)	5.595*** (154.694)	5.576*** (154.944)	5.550*** (100.082)
Number of observations (N)	486	486	486	642	642	642
Adjusted R ²	0.191	0.068	0.073	0.127	0.119	-0.971
Centered R ² (r2c)		0.095	0.100		0.138	-0.928
Uncentered R ² (r2c)		0.999	0.999		0.999	0.999
Under identification test (Kleibergen-Paaprk LM statistic) (idstat)		135.917	17.546		303.735	24.258
P-value for under identification test (idp)		0.000	0.093		0.000	0.019
Hansen J statistics (over identification test of all instruments) (j)		6.910	6.666		41.516	10.540
P-value for over identification test (j)		0.806	0.757		0.000	0.483

Note: *** p<0.01, ** p<0.05, * p<0.1; The instruments are regional dummies and pre and post natal shocks. IV version1: only preschool enrolment is endogenous ; IV version 2: both preschool and z-score of height for age are endogenous variables

Table A5.5: Descriptive statistics of variables used the regressions above

	Mean	Std. Dev.	Min	Max
Z-score of height-for-age at the age of one year	-0.943	1.774	-6.040	8.170
Z-score of height for age at the age of eight years	-1.193	1.119	-6.570	4.590
Dummy variable for a child begun formal school	0.872	0.334	0.000	1.000
Calculated age in months for deriving z scores in round 1	12.329	3.582	6.100	18.233
Calculated age in months for deriving z scores in round 2	62.451	3.779	55.294	74.743
Wealth index for 1-year-olds (Round 1)	0.330	0.152	0.006	0.757
Wealth index for 5-year-olds (Round 2)	0.373	0.153	0.008	0.881
Dummy for male	0.522	0.500	0.000	1.000
Number of children below 7 and above 65 years old	1.524	0.701	1.000	5.000
Number of children between 7 and 17 years old	1.304	1.341	0.000	8.000
Number of male family members > 17 and less than 65 years	1.165	0.821	0.000	5.000
Number of female family members > 17 and less than 65 years	1.410	0.824	0.000	6.000
what is the highest grade completed by primary caregiver?	4.984	4.302	0.000	14.000
what is the highest grade completed by father?	6.590	4.749	0.000	14.000
3.12.1 how many months did you breastfeed name?	28.930	13.523	0.000	36.000
Five point Likert scale for the relative size of child when born (-2 to 2)	0.056	1.069	-2.000	2.000
Dummy for child had health problems at the age of one year	0.430	0.495	0.000	1.000
Site dummies				
Dummy for site 2	0.121	0.326	0.000	1.000
Dummy for site 3	0.117	0.322	0.000	1.000
Dummy for site 4	0.116	0.320	0.000	1.000
Dummy for site 5	0.117	0.322	0.000	1.000
Dummy for site 6	0.122	0.328	0.000	1.000
Dummy for site 7	0.125	0.331	0.000	1.000
Dummy for site 8	0.117	0.322	0.000	1.000
Dummy for site 8	0.048	0.215	0.000	1.000
Dummy for illness	0.349	0.477	0.000	1.000
Dummy for theft	0.097	0.296	0.000	1.000
Dummy for increased input prices	0.191	0.393	0.000	1.000
Dummy for divorce or separation of family	0.058	0.234	0.000	1.000
Dummy for place employment shutdown or job loss	0.172	0.378	0.000	1.000
Dummy for decrease in food availability	0.340	0.474	0.000	1.000
Dummy for job loss/source of income/family enterprise	0.183	0.387	0.000	1.000
Dummy for divorce or separation	0.059	0.236	0.000	1.000
Dummy for severe illness or injury	0.138	0.346	0.000	1.000

N=745