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## Article

### Determinants of academic performance of grade 10 students : empirical evidence from high schools of Tigray Regional State

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# Determinants of Academic Performance of Grade 10 Students; Empirical Evidence from High Schools of Tigray Regional State

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## Abstract

This study examined determinants of academic performance of grade 10 students in Tigray. A sample of grade 10 students in high schools of 17 Woredas in 2015 academic year was used following probability sampling techniques. Based on estimation of Multiple Linear Regressions and Ordered Probit models, we have got significant difference in academic performance of students in terms of their sex and residence. Female and rural students are found to have lower academic performance than their male and urban student counterparts respectively. Moreover, natural science background, good future expectation, study hour, academic talent measured by student's score in grade 8, and student's friend score in grade 9 is found to have positive and significant effect on academic performance. From the group of family-related variables, parent's poverty, religious status of student's father and number of siblings are found to have negative effect on academic performance of students. From the group of school and policy related variables; we have found positive and significant effect of private schools, one to five networking, and affirmative action on academic performance. On the other hand, school distance measured by walking minutes to school is found to have negative effect on academic performance of students.

## Key words

Determinant, academic, performance

## JEL Codes: I2

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## 1. Introduction

Education is an instrument to eliminate conservative cultures which are barriers to development, enhances the human capital formation and thereby helps develop the capacity of making wealth. Investing in people provides the firmest foundation for lasting development. Development should be viewed in terms of peoples' access to the vital needs in life such as health, education, social equality, self-respect, freedom from social harassment and gender equality. Therefore, education is not only a means to improve human capital and productivity of a given nation but also a basic human need in life. That is why all countries around the globe are struggling to ensure access to quality education for all especially in primary and secondary schools (Francis *et al.*, 1974; Sen, 2000; WBR, 1991). As one of the principal goals of the millennium development goals, the UN has declared to achieve equitable universal access for primary education by the year 2015. Similarly, as per the five-year Growth and Transformation Plan of Ethiopia (GTPE), the Education Sector Development Program-IV (ESDP-IV) has the goal of producing democratic, efficient, effective, knowledgeable, inspired, and creative citizens who contribute to the realization of the nation's vision of being a middle-income economy (MoFED, 2010).

The striking question is the reason behind the lower national test scores of Tigray high school students as compared to the students from other regional states. The Education Statistical Annual Abstract (2010/11-2012/13) reveals a higher percentage of students failing to join their preparatory education in view of the superior and equitable access. The percentage of students scored below 2.00 are reported to be 29.75% higher than that of Amhara, Somali and Addis Ababa in 2010/11 and 35.29% and 37.29% higher than that of Amhara, Afar, Harari, Addis Ababa, and Somali in the years 2011/12 and 2012/13 respectively. Similarly, the percentage of students failed to join preparatory education are reported to be 65.42% and 68.71% higher than that of Afar, Amhara, Harari, Somali, and Addis Ababa in the years 2010/11, 2011/12 respectively and 68.85% higher than that of Amhara, Harari, Somali, and Addis Ababa in the year 201/13. Moreover, the percentage of female students scored below 2.00 are reported to be 37.92% higher than that of Harari, Afar, Somali, and Addis Ababa in 2010/11, 44.51% higher than that of Benshangul Gumuz, Amhara, Afar, Harari, Addis Ababa and Somali in 2011/12, and 44.3% higher than that of Addis Ababa, Afar, and Somali in 2012/13.

In a nutshell, Tigray regional state has not registered as much an attractive result in national test scores of high school students as it has in improved and equitable access to high school education as compared to other regional states especially regions like Somali and Afar which have lagged behind in terms of school infrastructure. The percentage of students scoring below 2.00 and failed to join their preparatory education is found to be higher and even increasing over time. On top of this, despite its higher equity of education as the Gender Parity Index indicates, the percentage of female students scoring below 2.00 and failed to join their preparatory education are found to be higher than that of males and increasing over time as well even though they have affirmative action benefits over their male counterparts. This calls for further research in the education sector of the Tigray region to investigate the factors behind the low score of grade 10 students in Ethiopian General Secondary Education Certificate (EGSEC). Based on the above facts, the researchers have posed to answer the subsequent research questions as follows:

- *What do the trends of failing and preparatory joining students look like in the past 14 years?*
- *Is there a significant difference in EGSEC score between female and male students?*
- *Do child labour and student's future expectation on returns to education significantly affect academic performance?*
- *Do the policy variables, 1 to 5 networking and affirmative action; improve the academic performance of students?*
- *What are the other significant students, family, and school-related factors that affect academic performance?*

## 2. Literature review

Students' academic performance has been the subject of many researchers in the past. A number of factors influencing students' academic performance have been identified in the previous studies. All of the studies support the hypothesis that student performance depends on different socio-economic, psychological and environmental factors. Household income is one of the factors affecting student's academic performance. Previous studies revealed conflicting result regarding the relationship between household income and student's academic performance. Higher household resource or income levels lead to higher academic performance of students because money can buy all the comforts that students need to concentrate on their studies, and vice versa (Farooq *et al.*, 2011; Barry, 2005; Odumbe, *et al.*, 2015). In the contrary, (Hijazi and Naqvi, 2006; Nyipir, 2010; Raychaudhuri, *et al.*, 2010) find that student's family income has no impact on his/her academic performance because students belonging to more prosperous/affluent family do not give proper weight to studies. i.e. Affluence cannot make a student serious about his/her studies.

Parental education is another factor influencing students' academic performance (Raychaudhuri *et al.*, 2010; Farooq *et al.*, 2011; Hijazi and Naqvi, 2006; Bonga, 2010; Nyipir, 2010; Ampofo and Osei-Owusu, 2015). Educated parents can better communicate with their children regarding the school work, activities and the information being taught at school. They can better assist their children in their work and participate at school, motivate their children to study harder and have better results. Besides, better educated parents are expected to be more aware of importance of education and therefore invest more in their children's education. The findings revealed that there is a positive and significant relationship between the level of education of parents and students' academic performance. Odumbe *et al.* (2015), on the other hand, describes parental level of education had low influence on student academic performance. Studies identify that sex also can influence students' academic performance, but with conflicting results. Farooq *et al.*, (2011) depicts that girls usually show more efforts leading towards better grades at school while Bonga (2010) and Raychaudhuri *et al.* (2010) show that Male students academically perform better than female students.

Student's academic performance is also influenced by walking distance to school and back (Bonga, 2010; Odumbe *et al.*, 2015). It is found that the longer the distance a student has to walk to school and back the less he/she performs at school. This is because by the time the student reaches school, he/she is tired and this will reduce his/her academic performance. Besides, the effective time of study will be reduced. Raychaudhuri *et al.* (2010), however, depicts there is no significant impact of walking distance to school and back on student's academic performance. Demographic structure of household in which students live also affects their academic performance. As of Barry (2005) an increased number of siblings decreased test score of students. This is because students with fewer siblings are likely to receive more parental attention and have more access to resources than students from large families. The additional attention and support leads to better school performance. Furthermore, Barry (2005) revealed past academic status and peer characteristics are the other factors which influence student's academic performance. The finding shows that students with poor academic status did have lower test score and students whose friends engaged in negative activities had lower test score.

Student attendance and academic performance is found positively related in previous studies. This shows that regularly attending the class shows the effort and seriousness of students about his or her studies (Hijazi and Naqvi, 2006;

Raychaudhuri *et al.*, 2010; Odumbe *et al.*, 2015). Studying hours is another factor influencing student academic performance. Hijazi and Naqvi (2006) describes studying hours has no significant impact on student academic performance; it may depend on intelligence level, intellect, memory or method of learning of the student. Although all of the previous researches support the hypothesis that student academic performance depends on different socio-economic, psychological and environmental factors, some factors are found having conflicting impact on academic performance of students. This indicates that another study is required to conciliate studies with conflicting results. In addition, a number of literatures reviewed adopted descriptive methods of data analysis with only some factors receiving significant attention. The literatures reviewed which used econometric model are also found with the problem of giving significant attention only for some factors. The current study contributes to existing literatures in that it is more comprehensive that is it gives greater attention for greater number of variables which are believed to have impact on academic performance of student and use two alternative econometric models (i.e. a multiple linear regression model and an ordered Probit model). Thus, it is possible to better understand the factors which contribute to student's success and student's failure and recommend appropriate policy action.

### 3. Methodology of research

With cross-sectional research design; primary data were collected using structured questionnaires from grade 10 students in the 2015 academic year within two phases. Firstly, detailed data on student, family, school and policy related were collected in April 2015 before the EGSEC was given, then data on the EGSEC results of the sampled students was collected in September 2015 after the exam results were released. Multi-stage sampling was utilized. Tigray has seven zones, sample 'Woredas' (districts) from all zones were selected using simple random sampling depending on the size of each zone, 4 Woredas each from Central and Eastern Zone, 3 Woredas each from North Western and Southern Zone, 1 Woredas each from Western and South Eastern Zones, finally Mekelle was incorporated as the 17<sup>th</sup> Woreda.

A total of 26 high schools were surveyed from rural and urban Woredas. Then, sections of students from each high school were selected using simple random sampling. Finally, student respondents were selected from each section using systematic random sampling. We have collected data from a total of 1456 samples. Distribution of the sample size among the Zones was made proportionally based on the shares of high school students in each Zone to the total number of high school students in the region. Distribution of the samples is made based on this proportion. Besides, secondary data were collected from Ministry of Education of Ethiopia.

#### 3.1. Models

The Multiple Linear Regression Model was used assuming a linear relationship between the EGSECE scores of the students and the explanatory variable. The same model was also used for the same purpose by Huang (2011) in Utah State University, Di Mo *et al.* (2010) in China, Bezerra *et al.* (2009) in Brazil, and Watson (2008) in Vietnam. The model is given by;

$$S = X\beta + U \quad (1)$$

Where, S is the EGSECE score of students and is the dependent variable, X is a vector of explanatory variables,  $\beta$  is a vector of parameters and U is a vector of disturbance terms. This model can be estimated using ordinary least squares.

The Ordered Probit Model was one type of multi-response models for which the alternatives have some logical ordering. According to Verbeek (2004), multi-response models are developed to describe the probabilities of each of the possible outcomes as a function of personal characteristics or other variables. In our case, the dependent variable EGSEC score of students can be taken as a multi-response variable with three possible outcomes having a logical ordering. Those outcomes are a low score for those who fail, the medium score for those who join TVET, and a higher score for those who join preparatory education. Following Verbeek (2004), Wooldridge (2010), and Green (2012) the ordered probit model can be given as below. Let S be a score of students with three outcomes taking values {0, 1, 2}. The ordered probit model for S conditional on the explanatory variables X can be derived from a latent variable [student's performance] model. Assuming the latent variable  $S^*$  is given by;

$$S^* = X\beta + u \quad (2)$$

Where, the error term u conditional on the explanatory variables 'X' is normally distributed with '0' mean and variance of '1'.

i.e.  $u/X \sim N(0, 1)$  Let  $\alpha_1$  and  $\alpha_2$  be the cutoff points or the minimum points to join TVET and Preparatory school respectively. Now, the EGSECE score 'S' can be given by;

$$S = 0 \text{ if } S^* < \alpha_1$$

$$S = 1 \text{ if } \alpha_1 \leq S^* < \alpha_2$$

$$S = 2 \text{ if } S^* \geq \alpha_2$$

(3)

Where, S='0' indicates failure or low performers, S='1' indicates students joining TVET or medium performers, and S='2' indicates students joining preparatory education or higher performers. Having the normality assumption on the error term u, the response probability for each outcome is given by;

$$P[(S = 0)/X] = P[(S^* < \alpha_1)/X] = P[(X\beta + u < \alpha_1)/X] = \Phi[\alpha_1 - X\beta]$$

$$P[(S = 1)/X] = P[(\alpha_1 \leq S^* < \alpha_2)/X] = P[(\alpha_1 \leq X\beta + u < \alpha_2)/X] \\ = \Phi[\alpha_2 - X\beta] - \Phi[\alpha_1 - X\beta]$$

(4)

$$P[(S = 2)/X] = P[(S^* \geq \alpha_2)/X] = P[(X\beta + u \geq \alpha_2)/X] = 1 - \Phi[\alpha_2 - X\beta]$$

Where,  $\Phi(\cdot)$  is the standard normal cumulative distribution function and this model can be estimated using the maximum likelihood method.

#### 4. Data analysis and results

##### 4.1. Descriptive results

##### *Trends of Academic Performance of Grade 10 Students in Tigray*

In this section, we have examined the trends of academic performance of grade 10 students in Tigray over the last 14 years, 1993-2006 E.C. To this end, we have used secondary data collected from the Ministry of Education and Bureau of Education of Tigray and comparisons with academic performance of students in the other regions were made.

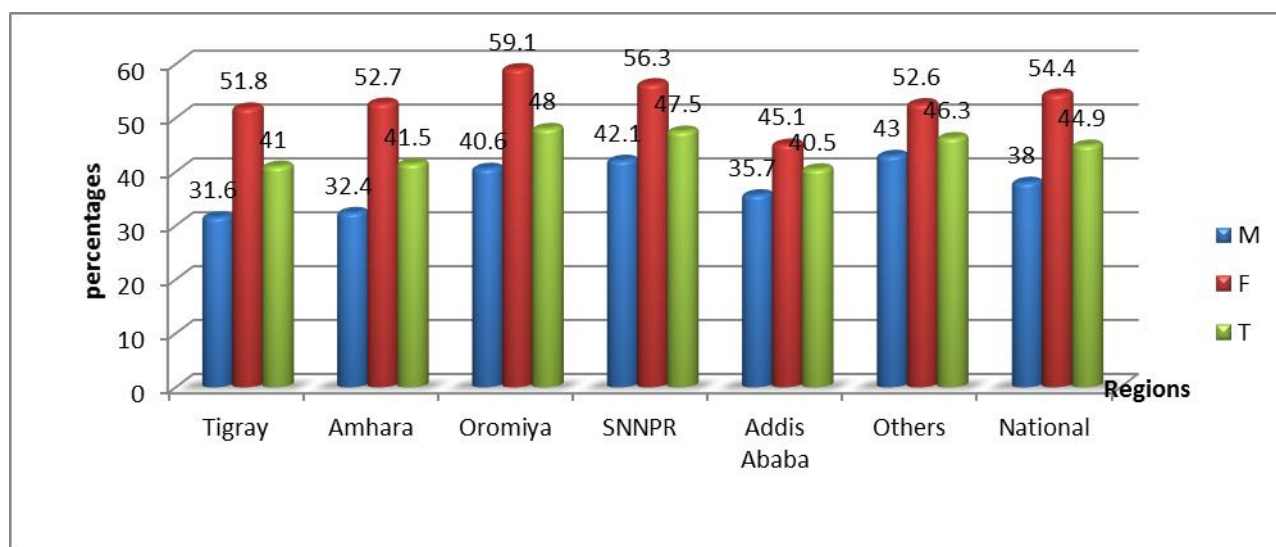


Figure 1. Average percentage<sup>1</sup> of failed students by sex and region, 1993-2006 E.C

According to the MoE, students who score 2 points or above in the EGSEC are generally considered as promoted students. Therefore, students who score below 2 in their EGSEC are said to be failed students. Based on Figure 1, Tigray has registered the lowest percentage of failed males (31.6%) and the second lowest percentage of failed females (51.8%) next to Addis Ababa (45.1%). Overall, Tigray has registered the second lowest percentage of failed students (41%) next to Addis Ababa (40.5%) and followed by Amhara (41.5%), SNNPR (47.5%) and Oromiya (48%) in the last 14 years. Although Tigray performs comparatively better than the other regions in Ethiopia, the magnitude of 41% of failed students can never be

<sup>1</sup> The percentages indicate percentage shares of failed students to the total number of students in each category;

% of Failed females =  $\left[ \frac{\text{Failed females}}{\text{Total females}} \right] 100$ , % of Failed males =  $\left[ \frac{\text{Failed males}}{\text{Total Males}} \right] 100$ , % of Total Failed =  $\left[ \frac{\text{Total Failed}}{\text{Total Students}} \right] 100$

considered as a good performance indicator. Therefore, it needs further effort to reduce the number of students failing to pass the EGSEC. On top of the percentage of failed students, comparisons among regions can also be made based on the number of students joining preparatory education. The cutoff point for joining preparatory education is not standardized and fluctuates from year to year based on the number of students expected to join higher education and the capacity of higher education institutions. Moreover, there are affirmative action schemes for female students and for students of pastoralists. This might make comparisons across regions and sexes flawed. But, comparisons among the five major regions which are free from these problems can be effectively made.

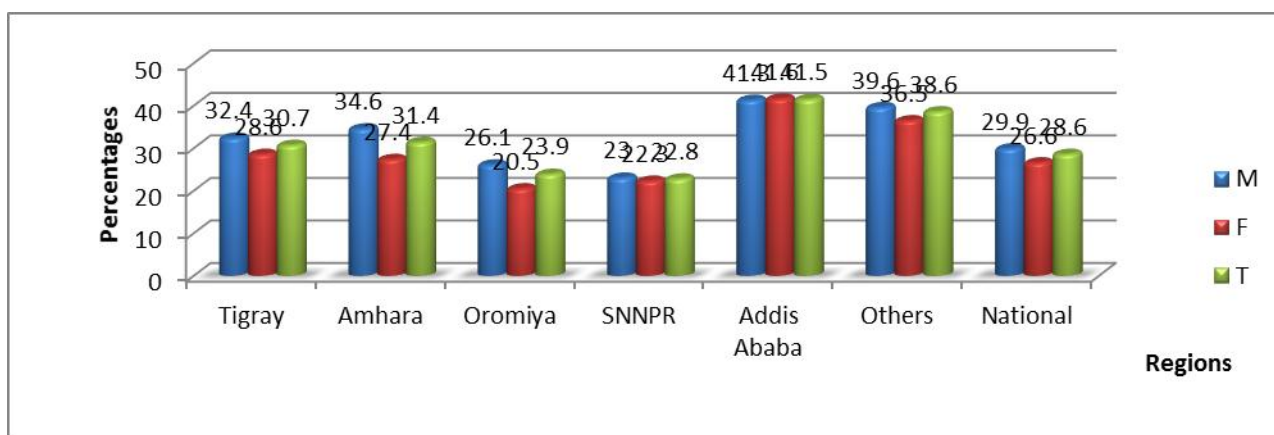


Figure 2. Average percentage<sup>2</sup> of preparatory joined students by sex and region, 1993-2005E.C

According to Figure 2, Tigray has registered moderate percentage of preparatory joined males (32.4%) higher than Oromiya (26.1%) and SNNPR (23%) and lower than Amhara (34.6%) and Addis Ababa (41.3%). However, it has registered the second highest percentage of preparatory joined females (28.6%) next to Addis Ababa (41.6%). Overall, Tigray (30.7 %) has performed better than Oromiya (23.9%) and SNNPR (22.8%) and lower than Amhara (31.4%) and Addis Ababa (41.5%).

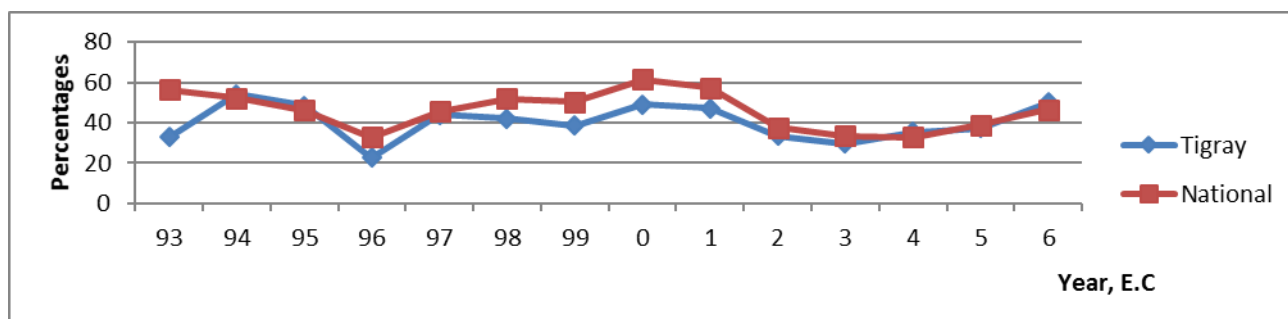


Figure 3. Trends of the percentage of failed students, 1993-2006 E.C

As we can see from Figure 3, the trend of the percentage of failed students in Tigray had a similar irregular pattern with the national average over the past 14 years. For most of the years, the trend in Tigray rests below the national average indicating better performance comparatively with other regions.

The trend is full of irregularities meaning the percentage of students failing is neither increasing nor decreasing over time. Based on the data, the lowest percentage of failed students is registered in the year 1996 E.C (22.7%) and with the highest ever percentage of failed students registered in the year 1994 E.C (54%). Unfortunately, the percentage of failed students has been continuously increasing during the GTP-I period, since 2003 E.C which should be a major area of concern for the government.

<sup>2</sup> The percentages indicate percentage shares of preparatory joined students to the total number of students in each category. i.e.

$$\% \text{ of Preparatory females} = \left[ \frac{\text{Preparatory joined females}}{\text{Total females}} \right] 100, \% \text{ of Preparatory males} = \left[ \frac{\text{Preparatory joined males}}{\text{Total Males}} \right] 100,$$

$$\% \text{ of Total preparatory} = \left[ \frac{\text{Total preparatory joined}}{\text{Total Students}} \right] 100$$

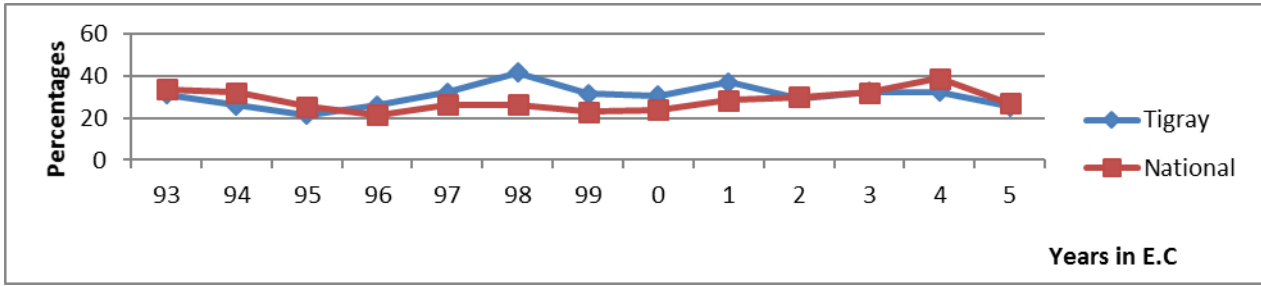


Figure 4. Trends of the percentages of preparatory joined students, 1993-2005 E.C

As we can clearly see from fig. 4 above, the trend of the percentage of students joining preparatory education is full of irregularities over the last thirteen years. However, it had been continuously decreasing from 1993-1995 E.C, continuously increasing from 1995-1998 E.C, and generally tends to decrease from 1998 E.C onwards with the exception of 2001 E.C in contrast to the generally increasing trend for the national average since 1998 E.C. The recently deteriorating performance of the region in terms of percentages of failed and preparatory joined students should receive due attention from all of the concerned bodies in the region.

Finally, comparisons between the academic performance of female and male students can be made within the Tigray region. Based on fig. 5 below, the shares of females to both of the total failed and preparatory joined students have been increasing over the last 14 years. The increasing trend of shares of female students to the total failed students indicates the lower performance of females than their male counterparts. The increasing trend of shares of female students to the total preparatory joined students, on the other hand, indicates better performance of females than their male counterparts. However, the increasing trend of preparatory joined female students is due to the affirmative action policy, not due to their superior academic performance. Therefore, the difference in academic performance across sexes is also a major area of concern for the government and other stakeholders.

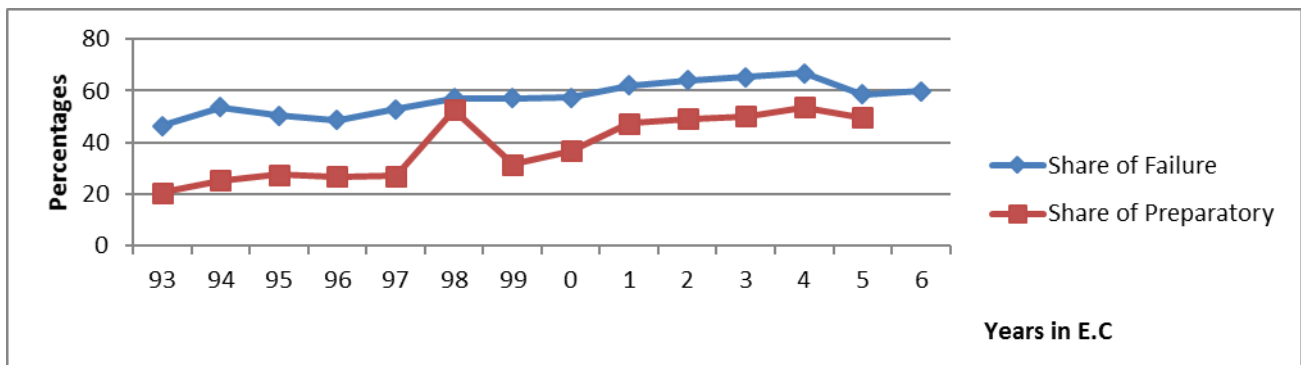


Figure 5. Trends of percentage shares of female students in Tigray, 1993-2006 E.C

4.2. Empirical results

Marginal Effects of Student Related Factors on Academic Performance

Table 1. Marginal effects (dy/dx) of student-related variables on EGSECE score and status

Variables	OLS Regression Post Estimation dy/dx	Ordered Probit Regression Post Estimation		
		Pr. of Failure dy/dx	Pr. of Joining TVET dy/dx	Pr. of Joining Preparatory dy/dx
Female	-0.190248***	0.1312975***	0.0121803***	-0.1434778***
Rural Residents	-0.0862737**	0.0627379*	0.0053022*	-0.0680401*
House Rent	-0.0122326	-0.008899	-0.0008059	0.009705
Natural Science Background	0.0873436***	-0.066123***	-0.006784**	0.0729073**
Reference Book	0.008797	-0.011461	-0.0009524	0.0124132
Expectation	0.0633539*	-0.015829	-0.0012741	0.0171033
Light Source	-0.0508267	0.0220745	0.0021071	-0.0241816

Addiction	0.000868	-0.014112	-0.0013297	0.0154412
Study Hour	0.0061221***	-0.004519***	-0.0003893***	0.0049084***
Score-Grade 8	0.0058901***	-0.003749***	-0.0003229***	0.0040715***
Friend Score-Grade 9	0.0042928***	-0.002794**	-0.0002407*	0.0030351**
Absenteeism	-0.0006948	-0.00256	-0.0002205	0.0027808
Working Hours	-0.0009515	0.0001163	0.00001	-0.0001264

\*\*\*, \*\*, and \* indicate significant variables at  $\alpha=1\%$ ,  $\alpha=5\%$ , and  $\alpha=10\%$  respectively

**Source:** Own computation, 2015

From the OLS estimation in Table 1 below, the dummies for female, rural residents, natural science background, and expectation are found to be significant determinants of EGSEC score. Moreover, the variables study hour, score in grade 8, and friend's score in grade 9 are found to be highly significant determinants of EGSEC score. Based on the estimated parameters, EGSEC score of female students is significantly lower than males by 0.19 points EGSEC score of rural students is significantly lower than urban students by 0.086 points. Similarly, students with natural science background are found to have significantly higher EGSEC score than those with social science background by 0.087 points and students with good expectation on returns to education are found to have significantly higher EGSEC score than students with the non-good expectation by 0.063 points. Thus, changing the students' attitude on the returns to education and helping students to excel in natural science subjects are good mechanisms for improving their academic performance.

Moreover, a 1-hour increase in study hour leads to a 0.006 points increase in EGSEC score, a 1-point increase in grade 8 average score leads to a 0.006 points increase in EGSEC score, and a 1-point increase in friend's average score in grade 9 leads to a 0.004 points increase in EGSEC score. Therefore, more study hours, good academic background (academic talent) and having academically good performing friends are important inputs for better academic performance. The other student-related variables such as house rent, reference book, the source of light, addition, absenteeism and working hours are found to have an insignificant effect on EGSEC score of students. In other words, there is no significant difference in EGSEC score of students whether they live in house rent or with their parents, whether they possess their own reference books or not, whether they use 'ampul' (lamp) during studying, and whether they involve in addition activities as stimulants or not. Moreover, there is no significant effect of students' absenteeism and working hours on EGSEC score.

From the ordered Probit estimation, we can see the marginal effects of the student-related variables on the probabilities of failure, joining TVET and joining preparatory education. The effects of each explanatory on the probabilities of the lowest outcome [probability of failure] and the highest outcome [probability of joining preparatory education] are unambiguously known and are opposite in direction. However, the effects of the explanatory variables on the probability of the medium outcome [probability of joining TVET] are ambiguous with the possibility of taking the same direction as either the lowest or the highest outcome. Therefore, a positive effect on the probability of failure implies a negative effect on the probability of joining preparatory education and vice versa whereas the effect on the probability of joining TVET depends on the strength of the effect on the probabilities of failure and joining preparatory education. According to table 1, the model variables female students were found to have a significantly higher probability of failure of 13%, higher probability of joining TVET of 1.2% and lower probability of joining preparatory education of 14.3% than their male counterparts. Similarly, rural students were found to have a significantly higher probability of failure of 6.3%, higher probability of joining TVET of 0.5% and lower probability of joining preparatory education of 6.8% than their urban counterparts.

Moreover, students with good natural science background were found to have a significantly lower probability of failure of 6.6%, lower probability of joining TVET of 0.67% and a higher probability of joining preparatory education of 7.3% than students with a good social science background. The continuous variables study hour, score in grade 8 and friend's score in grade 9 were found to be significant determinants of EGSEC status. Based on the estimated marginal effects an hour increase in study hour decreases the probabilities of failure and joining TVET by 0.45% and 0.04% respectively and it increases the probability of joining preparatory education by 0.49%. Similarly, a 1-point increase in grade 8 average score decreases the probabilities of failure and joining TVET by 0.37% and 0.03% respectively and it increases the probability of joining preparatory education by 0.4%. Moreover, a 1-point increase in friend's average score in grade 9 decreases the probabilities of failure and joining TVET by 0.28% and 0.02% respectively and it increases the probability of joining preparatory education by 0.3%. Finally, the other student-related variables such as house rent, reference book, expectation, light source, addiction, absenteeism and working hour were found to have an insignificant effect on the probabilities of failure, joining TVET and joining preparatory education.



*Marginal Effects of Family-Related Factors on Academic Performance*

Based on the marginal effects of the family related variables in table 2, parent's poverty status and religious status of the student's father were found to be significant determinants of EGSEC score. Students from poor parents were found to have a significantly lower score of 0.14 points than students from non-poor parents. Moreover, students whose father was religious [Priest or Sheikh] were found to have a significantly lower score of 0.12 points than students with the non-religious father.

Table 2. Marginal effects (dy/dx) of family-related variables on EGSECE score and status

Variables	OLS Regression Post Estimation dy/dx	Ordered Probit Regression Post Estimation		
		Pr. of Failure dy/dx	Pr. of Joining TVET dy/dx	Pr. of Joining Preparatory dy/dx
Parent's Poverty	-0.1426284***	0.0999427***	0.0040475*	-0.1039902***
Parent Living Status	-0.0022166	0.0406668	0.0025071	-0.0431739
Religious Status of Father	-0.1206483***	0.0890013***	0.005334**	-0.0943353***
Self-Sponsor	-0.0028023	0.0105909	0.0008438	-0.0114347
Mother's Education	-0.0031162	0.0036297	0.0003127	-0.0039424
Siblings	-0.0126148	0.0145083**	0.0012498**	-0.0157581**
Helping Hours	-0.0064482	-0.000434	-0.0000374	0.0004717

\*\*\*, \*\* and \* indicate significant variables at α=1%, α=5% and α=10% respectively

Source: Own computation, 2015

The other family-related factors such as parent's living status, self-sponsor, mother's education, the number of siblings and helping hours were found to have an insignificant effect on EGSEC score of students. In other words, a student with both parents alive was unlikely to have higher EGSEC score than those with either or both of their parents dead and self-sponsored students are less likely to have lower EGSEC score than students who were sponsored by their parents during their high school education. On the other hand, parent's poverty status, religious status of student's father and the number of siblings were found to have a significant effect on EGSEC status of students. According to table 2, students from poor parents were found to have a significantly higher probability of failure of 10%, higher probability of joining TVET of 0.4% and lower probability of joining preparatory education of 10.4% than students from non-poor parents. Similarly, students with religious father were found to have a higher probability of failure of 8.9%, higher probability of joining TVET of 0.53% and lower probability of joining preparatory education of 9.4% than students with the non-religious father.

Moreover, an increase in the number of siblings significantly increases the probabilities of failure and joining TVET by 1.45% and 0.12% respectively and reduces the probability of joining preparatory education by 1.57%. The other variables such as parents' living status, sponsor, mothers' education, and helping hours were found to have an insignificant effect on the probabilities of failure, joining TVET and joining preparatory education.

*Marginal Effects of School and Policy Related Factors on Academic Performance*

Table 3. Marginal effects (dy/dx) of school & policy variables on EGSEC score and status

Variables	OLS Regression Post Estimation dy/dx	Ordered Probit Regression Post Estimation		
		Pr. of Failure dy/dx	Pr. of Joining TVET dy/dx	Pr. of Joining Preparatory dy/dx
Private School	0.7433998***	-0.392447***	-0.1882758***	0.5807232***
School Location	0.0050179	-0.012043	-0.0010318	0.013075
School Distance	-0.0008874**	0.000562	0.0000484	-0.0006104
Network [1 to 5]	0.0815781**	-0.064167**	-0.0042161**	0.0683832**
Affirmative action		-0.268498***	-0.0742873***	0.3427855***

\*\*\*and \*\* indicate significant variables at α=1% and α=5% respectively

Source: Own computation, 2015

Based on the OLS marginal effects in table 3, the dummy for private school, school distance, and 1 to 5 networking were found to have a significant effect on the EGSEC score of students. Students in private schools were found to have 0.74 points higher EGSEC score than students in government schools and active participants in one to five networking are found to have 0.08 points higher EGSEC score than the inactive participants. Moreover, a 1-minute increase in walking distance

to school significantly reduces EGSEC score of students by 0.001 points. When we see the effects of the school and policy related variables on EGSEC status, private school, 1 to 5 networking, and affirmative action was found to be significant. School distance, though negatively and significantly affects EGSEC score, was found to have an insignificant effect on the probabilities of failure, joining TVET, and joining preparatory education. From the school-related variables, school location was found to have an insignificant effect on EGSEC score and EGSEC status.

In other words, there is no significant difference in EGSEC score and status between students learning in high schools of Zonal towns and students learning in high schools of Woreda towns. Based on the marginal effects of the ordered Probit estimation in table 3, learning in private schools significantly reduces the probabilities of failure and joining TVET by 39.2% and 18.8% respectively and significantly increases the probability of joining preparatory education by 58% than learning in government schools. Similarly, active participation in one to five networking significantly reduces the probabilities of failure and joining TVET by 6.4% and 0.4% respectively and significantly increases the probability of joining preparatory education by 6.8%. Finally, affirmative action significantly reduces the probabilities of failure and joining TVET by 26.8% and 7.4% respectively and significantly increases the probability of joining preparatory education by 34.3%.

## 5. Conclusions

According to the annual educational statistical abstracts of the Ministry of Education and the Bureau of Education of the region, Tigray is reported to have high performance in terms of school access and school quality measurements. However, it has not registered higher performance in EGSECE score of students as high as the performances in school access and school quality measures. Moreover, the academic performance of grade 10 students in the region is deteriorating from time to time in recent years. This problem motivates the authors to carry out this study with the objective of examining the effects of the various student, family, school and policy related variables on academic performance of grade 10 students measured by their EGSECE score. To this end, the authors have collected a secondary time series data from the Ministry of Education and from the Bureau of Education of Tigray for trend analysis and comparison of academic performance of Tigray students with students in the other regions of Ethiopia. Moreover, a primary data from grade 10 students of high schools in 17 /Seventeen/Woredas are collected using the probability sampling techniques in the 2015 academic year.

Academic performance of students can be measured in two ways; using the EGSECE score and using EGSECE status. EGSECE status is the status of the students based on their EGSECE score. Based on their EGSECE status, students are categorized in to three; Failed, promoted to TVET, and promoted to preparatory education. The determinants of academic performance of students can be student related, family related, school related and policy related variables. Two alternative models are estimated to examine the effect of each determinant on academic performance. The MLRM is used to examine the effects of the variables on EGSECE score and the ordered Probit model is used to examine the effect of each variable on the probabilities of failure, joining TVET, and joining preparatory education. From the group of student-related variables, the dummy for female and rural students were found to have a negative and significant effect on EGSEC score and status of students. The lower academic performance of females than males is similar to the findings of Bonga, 2014; Raychaudhuri et al., 2010 and Watson, 2008. According to Bonga (2014), female students perform lower than their male counterparts because they learn under unfavorable conditions. Parents also tend to motivate their sons for a better education than their daughters and this is not an exception in the Tigray region especially in the rural areas.

As we have seen in the descriptive analysis, female students have lower studying hours per week, travel for more minutes to arrive at school, spend more time helping their parents at home which makes them disadvantageous. Moreover, rural students learn under the unfavorable condition as compared to their urban student's counterparts. For instance, rural students are subjected to more absenteeism, more labor hour, and more traveling minutes to reach the nearest high school than urban students. This unfavorable condition might have contributed to lower academic performance of rural students. On the other hand, natural science background, expectation, study hour, the average score in grade 8, and friend's average score in grade 9 are found to have a positive and significant effect on academic performance of students. Natural science background measures the mathematical capability of students and it has got priority from the MoE as the basis for the development of Science and Technology in the country. Fortunately, students with a good background of Mathematics, Physics, and Chemistry outperform those who don't have the adequate background in these subjects. Mathematical capability can be a good measure of academic talent and students with more talent are more likely to outperform students with no talent.

The expectation on returns to education after the schooling measures the attitude of students towards education. High school students are mature enough to evaluate the returns from education after schooling and the returns from engaging in other areas of business. If students assume spending time in education is more valuable than spending time in business activities, they will pay high attention to education and become academically better performers. Obviously, more study hour

improves EGSEC score of students and this is similar to the findings of (Bezzera *et al.*, 2009). The average score in grade 8 measures academic background of students. Therefore, it is more likely for students with the better academic background to perform better than students with the weak background. Friend's score in grade 9 measures the peer effect on academic performance. Interestingly, students who have academically good performing friends are found to score higher in the EGSEC than students who have academically weak friends and this is similar to the findings of Barry (2005). Having academically well-performing friends tends to increase teamwork during studying, increased study hours and reduces time spent on irrelevant activities.

Child labor is one of the significant student related determinants of academic performance, however, child labor measured in working hours were found to have an insignificant effect on academic performance of students. Abafita and Kim (2015) also found the insignificant effect of child labor on child's school attendance and enrolment in Tigray region. High school students are mature enough to be forced by others to spend their time at work. Therefore, they are more likely to decide how much hours to spend at work and how much to spend at school. This might minimize the adverse effect of labor hour on the academic performance of high school students. From the group of family-related variables, poverty, religious status of fathers and number of siblings were found to have a significant and negative effect on academic performance of students. The negative effect of family poverty on academic performance is similar to the findings of Barry (2005); Bezzera *et al.* (2009), Farooq *et al.* (2011), Odum *et al.* (2015) and Watson (2008).

Poor parents can't afford to cover the necessary costs of education for their children. Children from poor parents may be subjected to more absenteeism, may spend more time at work can't fulfill education facilities and this reduces their academic performance. Religious status of fathers is chosen as an important explanatory variable because of the expectation of conservative behaviors. Religious fathers (Priests and Sheiks) are expected to be more conservative and promote religious education over secular education. This conservative behavior of religious fathers deters academic performance of their children. Moreover, the negative effect of the number of siblings on academic performance is similar to the findings of Barry (2005) and Bezzera *et al.* (2009). According to Barry (2005), students with a large number of siblings are more likely to receive low parental attention at home, low follow-up during their high school education, and have less access to resources than students with a small number of siblings. This has an adverse effect on academic performance of students.

The remaining family related factors such as parent's living status self-sponsor and mother's education and helping hours are found to have an insignificant effect on academic performance of students. Especially, the insignificant effect of mothers' education on academic performance is similar to the findings of Odumbe *et al.* (2015). As we have seen in the descriptive analysis, average education of students' mothers is found to be 3.8. Therefore, it is less likely for a junior elementary graduated mother to influence her child at high school. Moreover, high school students are too mature to be influenced by their mothers. The significant difference in score of students between the private and government schools might be attributed to the difference in school facilities such as science laboratories, computer laboratories, reference books, and differences in teachers' qualities, student follow-up systems, and school environment. The positive effect of one to five networking on EGSECE score is interesting in a sense that the government's policy intervention to the sector is becoming fruitful. The 1 to 5 networking is expected to promote group learning, increase cooperation and study time of students, thereby increasing their academic performance.

Affirmative action is the only mechanism through which the government can ensure equitable access to education at all levels. The significant gap between male and female students can be minimized through the affirmative action policy intervention. Finally, the negative effect of school distance on EGSEC score is similar to the findings of Bonga (2014) and Odumbe *et al.* (2015). If students travel for more hours to reach their school, they feel tired and are less likely to be active in class. This adversely affects their academic performance.

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