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Khat use and its impact on academic performance: The case of Jimma University, Ethiopia

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The use or misuse of addictive substances like khat has become widespread among the youths especially in countries where the substance is produced and/or consumed. In this paper, we examine whether khat use has any impact on the academic achievement of university students with particular reference to undergraduates in Jimma University, Ethiopia. Using data gathered from students between May to June 2011, the two-limit tobit model was employed to estimate the effect of khat use on students' grade point average (GPA), a measure of students' academic performance. The results reveal that khat use has a negative influence on students' academic performance at the university. On the other hand, however, students' academic performance at the university is positively related to their past performance (university entrance examination score) as well as parental education (household head) among others. Awareness creation on the negative impacts of the use of addictive substances like khat should, therefore, be carried out by the university management, local governments at various levels and policy makers at large. Interventions that target preparatory level education would, therefore, have higher returns in terms of human capital development.

Key words: Khat use, substance abuse, academic performance, Jimma University, Ethiopia, *Catha edulis Forsk*

INTRODUCTION

The use or misuse of addictive substances like khat (*Catha edulis Forsk*) is becoming increasingly widespread in recent years especially among the youth in general and university students in particular (Tesfaye et al., 2008;

Belew et al., 2000). It is a substance categorized with the broader class of psychostimulants like caffeine, cocoa leaves, cocaine and other substances used for their stimulating properties such as increased movement,

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arousal, vigor, wakefulness, and attention (Wood et al., 2013). Although the use of khat has a long history in Ethiopia, there has been dramatic increase in khat consumption after the adoption of the free market economic system in the 1990s. Many argue that the use of khat is both a social and a cultural activity (Al-Mutarreb et al., 2010; Manghi et al., 2009). It is widely believed to enhance social interaction, playing a role in ceremonies such as weddings.

Khat originated in Ethiopia and spread out to Kenya, Somalia, Djibouti, Uganda, Tanzania, Zimbabwe, Zambia, South Africa, and Yemen. Young buds and tender leaves are chewed to attain a state of euphoria and stimulation. Although khat is not illegal in these countries, its use has been restricted recently in the Western countries such as the UK, Canada, and the United States, and it is now classified as a controlled substance (Gebissa, 2010). In general, there is lack of consensus on the production and consumption of khat.

Some argue that khat is an essential crop as it stimulates people to work for long hours through increased concentration (Gebissa, 2010). They also emphasize the importance of khat in generating foreign exchange and creating employment opportunities (Gebissa, 2004; Klein, 2010). On the contrary, others argue that khat is an addictive substance with possible negative consequences. They believe that khat use makes users careless, less accountable and irresponsible, thereby increasing social crime (Beckerleg, 2010). In addition khat takes a significant share of the daily expenditure of regular users and hence diverts money away from productive activities. Hence, they favor strict government control on the production and distribution of the crop (Branko, 2008).

Despite the fact that khat is used by 5-10 million people daily (Numan, 2012; Odenwald et al., 2010) and its importance as cash crop among producers, there has been little interest among social scientists and other researchers regarding its effect on academic performance. A few studies have addressed the health effects of substances like cigarettes and khat in Ethiopia, focusing on psychiatric morbidity and psychosocial problems and their association with unsafe sexual behavior (Tesfaye et al., 2008; Kebede, 2002). However, studies on prevalence and extent of khat use among students and its likely impact on academic performance have been non-existent.

This study is, therefore, an attempt to bridge such gaps regarding khat and its use, with specific emphasis on identifying the potential impact on students' academic performance based on a sample of undergraduate students at Jimma University.

The study examined whether khat use had an impact on students' academic performance. Besides, students' perceptions about the potential impacts of khat use with regard to health and exposure to other addictions were

thoroughly examined.

Khat use and its impact

Khat is a stimulant used to improve performance, stay alert and increase work capacity (Cox and Rampes, 2003; Kalix, 1984). Night-shift workers use it to stay awake and postpone fatigue. Students chew khat to improve mental performance during examination weeks. Yemeni khat users believe that khat is beneficial for minor illnesses such as headaches, colds, body pains, fevers, arthritis and depression (Kennedy et al., 1983).

While there is a large and growing body of research on substance abuse, research conducted on khat is relatively not extensive. Most of available empirical evidence on khat focused on the behavioral impacts of khat use and its addictive power, tolerance and withdrawal effects. A few other studies have examined its psychological and socioeconomic impacts. Behaviourally, chewing khat is both a social and a cultural activity in countries where it is commonly used. In Yemen, khat is widely used among the Muslim community. Some even believe that chewing khat is considered as an element of religious practices. However, khat use is not limited to the Muslim community. Many Christians and Yemenite Jews in Israel also chew khat. In Ethiopia too, khat is also commonly used in a similar manner (Kebede, 2002).

In their review of the effects of psychostimulants, Favrod-Coune and Broers (2010) indicate that khat use is a socially accepted habit prevalent in some Asian and African countries, covering a spectrum of beneficial, non-problematic, problematic and addictive use. However, the authors add that data on the prevalence of and criteria for such levels of use are largely lacking (Favrod-Coune and Broers, 2010). Other authors have documented the addictive power, tolerance and withdrawal effect of khat use (Alem and Shibre, 1997; Kalix, 1988; Kalix and Khan, 1984).

With regard to psychological effects of khat use, it is widely considered in the literature that users report their subjective experiences in a positive way when consuming small amounts. They describe a feeling of well-being, a sense of exhilaration, excitement, increased energy levels, increased alertness, increased ability to concentrate, and improvement in self-esteem. Experiences like enhanced imaginative ability and capacity to associate ideas, improvements in the ability to communicate and subjective improvements in work performance are also documented in the literature. After chewing ceases, however, unpleasant after-effects tend to dominate these experiences including sleeplessness, lack of sensation, lack of concentration and low mood. Some chewers also experience these unpleasant effects even during the chewing process, describing anxiety, tension, restlessness and hallucinations (Cox and Rampes, 2003).

Objectively, khat users can be seen to show a range of experiences, from minor reactions to the development of a psychotic illness (Yousef et al., 1995; Panteliset al., 1989). Some studies confirm that the adverse effects of khat use are dose dependent (Alem and Shibre, 1997). With regard to the socioeconomic impact of khat use, some argue that regular use of khat has adverse socioeconomic effects. Loss of work hours, lower production, malnutrition, and misuse of money are some of the effects documented in the literature. This is indirectly linked to absenteeism and unemployment that in turn leads to reduction in overall economic activity. Moreover, it is reported that habitual khat chewing has led to decreased productivity in Ethiopia, Somalia, Uganda and Kenya. Quite on the contrary, others argue that moderate khat use improves performance and increases work output, owing to the stimulant and fatigue-postponing effects. Consequently, working hours and possibly productivity can decrease when khat is not used, because of reduced motivation. (Giannini and Castellani, 1986)

In relation to expenditure, khat takes significant share of regular users' budget. Kalix and Khan (1984), for instance, estimated that about 30% of all wages were spent on khat in Djibouti. There are cases where regular users secure their daily consumption of khat at the expense of vital needs, indicating dependence. Moreover, family life is damaged because of neglect, dissipation of family income and inappropriate behaviour. Khat use is quoted as a factor of one in two divorces in Djibouti (Elmi, 1983).

Khat use is also considered as a source of social evils such as criminal behaviour and even prostitution that are linked with attempt of acquiring funds to finance khat expenditure (Elmi, 1983). Self-harm and suicides have also been reported, although these incidences are rare in the literature. Each has been documented during both chewing and the subsequent intoxication phase. Suicide has been described by several authors in the context of a 'withdrawal state'. Violent acts, including homicide, are also documented usually in the context of unreasonable elusions (Alem et al., 1999; Alem and Shibre, 1997).

On the positive side, some studies have identified benefits of khat (both economic and social). Studies have shown that khat has become one of the major sources of export earnings to the national economy, a source of tax revenue for the federal and state governments, and significant cash incomes for farmers and all those involved in the khat value chain among others (Gebissa, 2008; Gebissa, 2004). In particular, the fact that khat is an ever-green and frequently harvested (up to three times a year) cash crop serving as a major source of income for the vast majority of smallholder farmers in khat growing areas becomes worth noting in this regard. A few studies have also tried to indicate the lack of definitive scientific evidence on the harm associated with

khat use as this would ruin the livelihood of many dependent on this economically significant crop in one way or another, particularly in the absence of appropriate alternative policy (Gebissa, 2010, Klein and Metaal, 2010, Gebissa, 2008).

Other studies have largely focused on the determinants of khat use. Determinants of khat use and its nature as a commodity may vary from place to place even in areas where its consumption is quite common. For instance, using household surveys from Yemen and Djibouti, Branko (2008) analysed determinants of khat consumptions. The results confirm huge importance of khat in daily life; with about one-half in Djibouti and 70% in Yemen of all households reporting at least one user. But in Yemen, khat consumption is astonishingly flat across income groups, age, and between rural and urban areas. In Yemen, khat was found to be a normal good and there is no indication that its use substitutes for food. In Djibouti, however, khat consumption increases with income, and seems to be a substitute for food consumption. In both countries, nevertheless, there is a strong gender bias in the use, where men are much more likely to use khat than women.

With reference to the Ethiopian case, empirical studies point out that there has been a dramatic rise in khat consumption recently and that its use among students especially during examination times is growing at an alarming rate (Gelaw and Haile-Amlak, 2004; Mossie, 2002). However, studies that were conducted on khat use habit are quite limited. Not only are such studies limited in number, but they are also limited in terms of their area of focus and the methodologies they employed. Most of the available studies focused on the prevalence of khat use and on the analysis of the socioeconomic covariates of khat use. While there have been several papers that dealt with poverty and factors for reducing poverty including education in Ethiopia, there are few papers that focus on education issue from the perspective of drug uses (Gebre-Egziabher 2010; Hurissa 2011). In fact, very few studies attempted to analyse the socioeconomic and health related impact of khat consumption, and their analysis lacked comprehensiveness and was shallow. Specifically, the impact of khat consumption on productivity was given very little emphasis.

In view of the strong link between human capital and economic development, it would be of paramount importance to understand factors that affect students' educational attainment, a key determinant of human capital formation. However, despite the ever-increasing use of khat especially among students, no attempt was made to our knowledge to empirically study the factors that affect academic performance and investigate the link between khat use and academic performance. Our paper attempts to bridge this gap in the literature by analysing the impact of khat use on performance quantitatively, using survey data gathered from undergraduate students

Table 1. Definition of key variables of the study.

Variable definition
Cumulative GPA (Cumulative Grade Point Average)
Khat use (1= yes, 0= no)
Age of the student (years)
Sex of the student (1 = male, 0 = female)
Comes from a rural family (1= yes, 0 = no)
Dummies for field of study (1=Env. Health, 2=Accounting, etc.)
Semester GPA (GPA during last completed semester)
University entrance exam score
Age of household head (years)
Sex of household head (1=male, 0=female)
Education of head (1= illiterate, 2= read and write, 3= grades 1- 4, 4 = grades 5-8, 5= grades 9-12, 6= above grade 12)
Occupation (1= farmer, 2= government employee, 3= trader, 4= others)
Family size (number)
Mother's education (codes same as those for education of head)
Pocket money (ETB)
Number of income sources received by students
Khat grows in the students region/home place (1 = yes, 0 = no)
Relationship with any khat-user (1 = yes, 0 = no)
Religion (1 = Islam, 2 = Christianity, 3 = Others)
Khat negatively affects health (1= yes, 0= no)
Khat enhances performance (1= yes, 0= no)
Frequency of khat use per week (1 = once or less, 2 = 2-4 times, 3 = above 4 times)

of Jimma University. To the best of our knowledge, this research is the first of its kind as it will provide theoretical framework and empirical analysis on a less explored but very important issue in the nation at large.

METHODS

Sampling procedure

Cross-sectional data were gathered through structured questionnaire from a representative sample of undergraduate students of Jimma University using a two-stage sampling procedure. Accordingly, out of six colleges of the university, three (50%) were selected in the first stage and simple random sampling procedure was applied to select the students per department in the corresponding college in the second stage. The exact number of students selected in the second stage was made proportional to the size of the classes in each batch. The questionnaires were designed in such a way that students selected to respond were asked to complete them with no mention of their names for anonymity. Instructors were asked to randomly distribute the questionnaires in class and ask them to complete and return them at the end. The response rate was 100%. Permission from the research and publication office of the university was obtained prior to the commencement of the survey. Only students who consented to take part in the study completed the questionnaires. The final sample size considered was 301. As with many survey data, the

data gathered for this study has missing information problems. In particular, some students were reluctant to reveal their grades/scores and this has led to missing information for those variables.

Definition of variables

Following the conceptual and analytical framework in the methodology part, a number of variables have been considered for this study. The major variables of interest are academic performance (measured by CGPA), Khat-use status, individual characteristics, and family socio-economic and demographic information. The list of all variables is given in Table 1 along with their corresponding definitions.

The empirical model

Quite a number of factors have been identified as determinants of students' academic performance in the literature. Individual characteristics also determine students' academic performance. Both econometric and descriptive methods were employed for data analysis. As a proxy for student academic performance, our dependent variable, we used semester grade point average (SGPA) and cumulative grade point average (CGPA). We specify our model as follows:

Table 2. Descriptive statistics.

Variable	N	Mean	S.D	Min	Max
Cumulative GPA	207	3.05	0.49	2	4
Semester GPA	226	3.10	0.56	2	4
Age of student	235	21.52	2.08	18	34
Gender of student	286	0.85	0.36	0	1
Khat use	239	0.35	0.48	0	1
Comes from a rural family	275	0.48	0.50	0	1
University entrance score	255	318.79	74.12	199	500
Age of the head	257	50.18	8.67	30	70
Gender of the head	276	0.68	0.47	0	1
Education of the head	290	3.51	1.85	1	6
Occupation of the head	286	1.87	1.00	1	4
Family size	263	7.16	2.08	4	12
Mother's education	282	2.90	1.81	1	6
Pocket money (ETB)	285	1.73	0.85	1	10
Khat grows in student's region	289	0.37	0.49	0	1
Relation with any khat user	285	0.54	0.49	0	1
Khat negatively affects health	262	0.76	0.43	0	1
Khat enhances performance	239	0.33	0.47	0	1

$$ACPR_i = \alpha_0 + \alpha_1 ENTR_i + \alpha_2 X_i + \alpha_3 KHUS_i + \varepsilon_i \quad (1)$$

where $ACPR_i$ is academic performance of student i ; X_i is a vector of individual, family, regional and other related characteristics that are expected to affect academic achievement of students; $ENTR$ is the initial academic performance of the student i (proxied by previous university entrance exam score); $KHUS$ is dummy variable that takes value 1 if the student regularly uses khat and 0 otherwise, α_2 is a vector of coefficients corresponding to the explanatory variables in X_i ; ε_i is the error term of the model; and α_3 is our coefficient of interest which measures the sensitivity of the academic performance to khat use.

Past studies on academic performance/achievement have identified individual characteristics (student age, sex, previous academic achievements, etc.), socio-economic background (parental socio-economic status including education, income, etc.), study subject (field of study), peer pressure, and enrollment status among others as key determinants of academic performance (Zwick, 2012). Most of these variables are also considered in this study. In fact, khat use – the subject of our study – is included as our main explanatory variable.

The range of possible values of our dependent variables (cumulative GPA and semester GPA) is 2.00 to 4.00. This gives rise to censoring at 2.00 from below (left) and at 4.00 from above (right). An appropriate model for such a case is the two-limit tobit model since OLS estimation would lead to inconsistent results (Nagin, 2005). Taking into account the possible endogeneity problem that would likely arise due to the fact that some or most of the variables that are determinants of $ACPR$ are also potential determinants of $KHUS$, we employ an instrumental variable regression (IV) estimation procedure. To do so, we first run a logit model for determinants of $KHUS$, which is specified as in equation (2) below

$$KHUS_i = \beta_0 + \beta_1 KHGR_i + \beta_2 KHTR_i + \beta_3 X_i + \varepsilon_i \quad (2)$$

where $KHGR$ is a dummy variable that takes 1 if the student comes from khat growing area 0 otherwise; $KHTR$ is a dummy that takes 1 if the student has a relationship with khat user and 0 otherwise; and X_i is a vector of other covariates. Using the predicted value from model (2) ($PKHUS$), our final model of academic performance in equation (1) becomes:

$$ACPR_i = \alpha_0 + \alpha_1 ENTR_i + \alpha_2 X_i + \alpha_3 PKHUS_i + \varepsilon_i \quad (3)$$

RESULTS AND DISCUSSION

Descriptive analysis

Our survey data reveal that about 35% of the students have used khat in the university and that there is a significant variation in khat use among students across different categories. For instance, male (85%), female (15%); urban (52%), rural (48%); khat growing areas (37%), non-khat growing areas (63%), relationship with khat-users (54%), no relationship with khat-users (46%); all of which had statistically significant differences. Detailed summary statistics is provided in Table 2.

Figure 1 shows the relationship between khat-use and academic performance for quintiles of cumulative GPA.

There is a clear trend that the proportion of khat-user students is higher in lower quintiles of CGPA, while this trend is reversed as we move into higher quintiles of CGPA, indicating a negative relationship between khat use and academic performance. Furthermore, there was

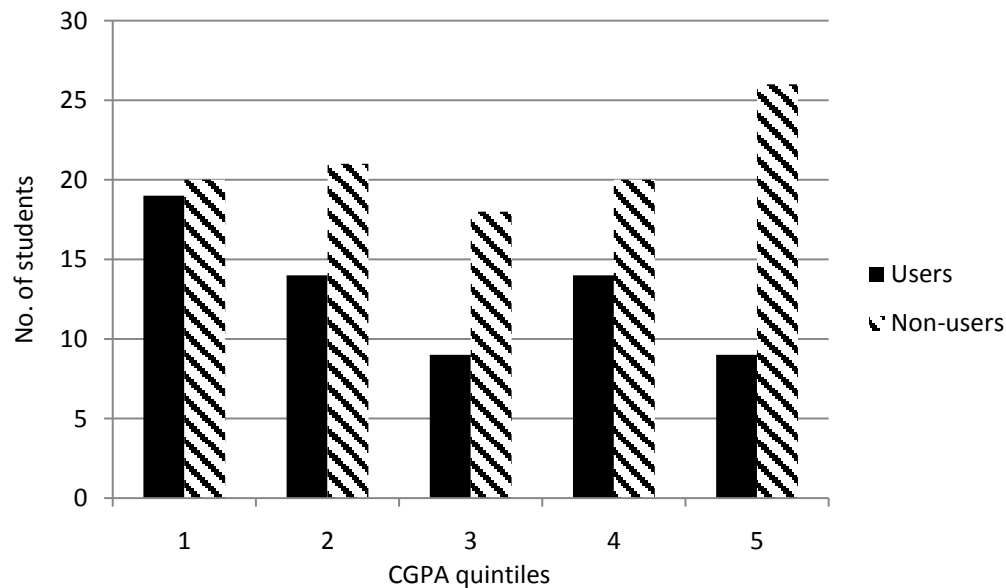


Figure 1. Students' academic performance by status use of khat

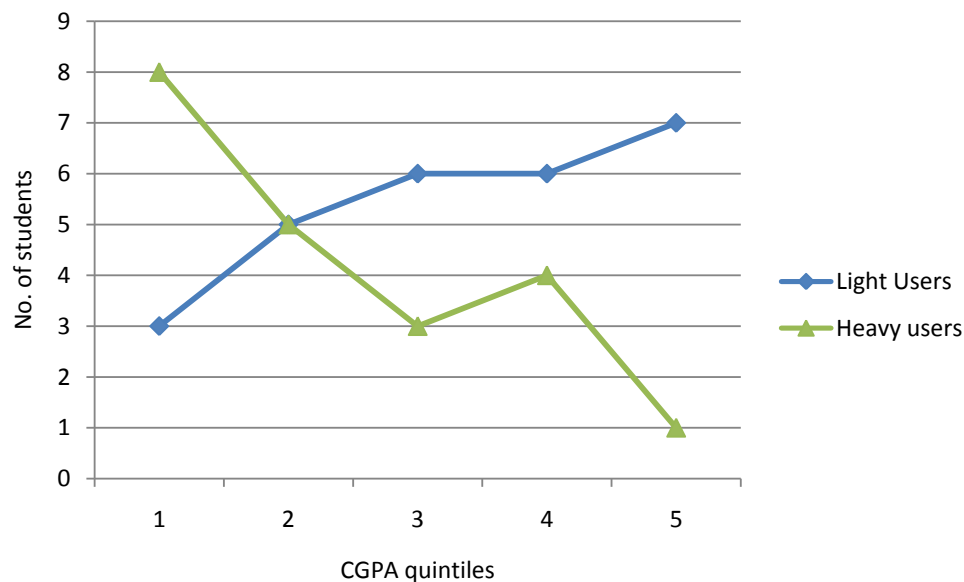


Figure 2. Students' academic performance by frequency of khat use.

a statistically significant mean difference in cumulative CGPA between khat-users and non-users based on t-test performed.

Figure 2 depicts the relationship between students' academic performance (cumulative CGPA) and frequency of khat use. Here, we define heavy users as those who use khat more than 4 days a week, while light users are those who use khat one day a week. Among the sample of khat users, we observe negative

association between cumulative CGPA and the number of students in each quintile as depicted by the negatively sloping curve for the heavy users, while there seems to be generally a positive relationship for the light-users as depicted by the positively sloping curve for that group of students. This is consistent with the finding for the whole sample in that khat use is generally negatively related to academic performance, and that among users, the heavy users are the most affected. The fact that the patterns of

Table 3. Determinants of the probability of khat use (logit model).

	(1)		(2)		(3)	
	Coef.	S.E	Coef.	S.E	Coef.	S.E
Gender	1.735*	(0.893)	1.650*	(0.933)	1.352	(1.580)
Religion						
<i>Christianity</i>	-2.229**	(0.874)	-2.156**	(1.039)	-1.785**	(0.776)
<i>Others</i>	0.326	(1.466)	0.121	(1.410)	1.384	(1.088)
Comes from rural area	-1.104*	(0.616)	-1.371*	(0.755)	-1.188	(0.881)
Log head's age	-2.449	(1.608)	-2.099	(1.619)	-2.144	(1.908)
Head's gender	0.583	(0.567)	0.558	(0.596)	0.543	(0.670)
Head's occupation						
<i>Gov. employee</i>	-0.282	(0.856)	-0.315	(0.991)	-0.726	(0.951)
<i>Trader</i>	1.641**	(0.763)	1.458*	(0.859)	2.624**	(1.087)
<i>Others</i>	2.719	(1.888)	2.282	(1.771)	2.599	(2.141)
Head's education	-0.596	(0.670)	-0.387	(0.880)	-0.590	(1.050)
Mother's education	0.747	(0.820)	0.142	(0.900)	0.885	(1.100)
Khat grows in student's region	1.719***	(0.627)	1.610**	(0.644)	1.819**	(0.728)
Relation with khat user	3.782***	(0.953)	3.558***	(0.975)	4.050***	(1.095)
Log of family size	1.619	(1.311)	1.148	(1.333)	2.037	(1.321)
No. Of income sources	0.740	(0.527)	0.624	(0.642)	0.593	(0.701)
Semester GPA	-1.876***	(0.620)	-1.649**	(0.677)	-1.739**	(0.833)
Log of pocket money	-0.611	(0.745)	-0.752	(0.765)	-0.515	(0.855)
Perception						
<i>Kkat affects health</i>			0.028	(0.775)		
<i>Khat enhances performance</i>					1.782***	(0.674)
Constant	5.961	(6.334)	5.847	(6.521)	3.219	(7.903)
No. of observations	123		108		102	
pseudo R ²	0.460		0.440		0.543	

Note: ***p<0.01, **p<0.05, *p<0.10.

relationship were opposite between heavy and light users could imply that the latter are somehow responsible users and hence less addicted. These findings are also consistent with reports that the effect of khat is dose-dependent (Nakajima et al., 2014; Nyachio et al., 2012; Nyongesa et al., 2008; Alem and Shibre, 1997).

Determinants of khat use

The analysis on determinants of khat use was carried out using logit regression as outlined in method section. The results are presented in Table 3.

As reported in column 1, students who are males, whose family occupation is trade, who come from khat growing areas and who have relationship with khat-user are significantly more likely to use khat. However, students who are Christians, come from rural areas and

secured higher GPA in the last completed semester (SGPA) are less likely to use khat. As expected peer pressure (relationship with khat users) and place of origin (whether or not khat grows in student's home region) are positively and significantly associated with khat use at the university. Male students are also found to be more likely to use khat than their female counterparts with statistically significance difference. Another factor found to be a significant determinant of khat use was religion, where Christian students were found to be less likely to use khat compared to their Muslim counterparts. Historically, khat use has been a long tradition widely practiced among Ethiopian Muslims (Gebissa, 2008).

Furthermore, we include the variable SGPA in the regression to see whether the poor performance in recent periods would motivate students to use khat with the hope that it would help them enhance their performance.

Consistent with our expectation, there was a

Table 4. Determinants of academic performance (tobit model).

	CGPA		SGPA	
	Coef.	S.E	Coef.	S.E
Predicted khat use	-0.811 ^{***}	(0.131)	-0.740 ^{***}	(0.151)
Gender	0.593 ^{***}	(0.112)	0.468 ^{***}	(0.128)
Log of head's age	-0.145	(0.215)	-0.371	(0.241)
Head's gender	-0.053	(0.079)	0.031	(0.090)
Head's occupation				
<i>Gov. employee</i>	0.067	(0.131)	0.020	(0.138)
<i>Trader</i>	0.101	(0.107)	0.068	(0.121)
<i>Others</i>	0.308 ^{**}	(0.148)	0.247	(0.179)
Head's education				
<i>Read and write</i>	-0.187	(0.127)	-0.191	(0.146)
<i>Grades 1-4</i>	-0.006	(0.164)	-0.162	(0.174)
<i>Grades 5-8</i>	0.122	(0.121)	-0.009	(0.140)
<i>Grades 9-12</i>	0.032	(0.146)	-0.130	(0.175)
<i>Over grade 12</i>	0.276 [*]	(0.156)	0.123	(0.180)
Mother's education				
<i>Read and write</i>	0.173	(0.125)	0.130	(0.149)
<i>Grades 1-4</i>	-0.014	(0.118)	0.002	(0.140)
<i>Grades 5-8</i>	-0.170	(0.125)	-0.247	(0.249)
<i>Grades 9-12</i>	0.121	(0.140)	0.058	(0.163)
<i>Over grade 12</i>	-0.042	(0.148)	-0.154	(0.177)
University entrance score	0.002 [*]	(0.0008)	0.002 ^{***}	(0.0007)
Log of family size	0.153	(0.126)	0.070	(0.146)
Log of pocket money	0.049	(0.097)	0.075	(0.113)
Constant	2.843 ^{***}	(0.862)	3.924 ^{***}	(0.964)
No. of observation	117		139	
pseudo R2	0.558		0.295	

Notes: Included but not reported are dummies for department and religion. ***p<0.01, **p<0.05, *p<0.10

significantly negative relationship between khat use and SGPA.

To check whether perceptions regarding khat-use have an influence on students' actual khat-use habit, we include two perception related variables, i.e., perceived impact of khat-use on health and performance (columns 2 and 3). The results show that perceptions regarding the negative health impact of khat are not significantly related to students' khat-use. However, perceptions regarding the positive impact of khat on performance are strongly associated with the likelihood of khat use. Therefore, students tend to use khat more if they think khat use improves their academic performance.

The impact of khat use on academic performance

As outlined in method section, we used the two-limit tobit

model since our dependent variable (students' academic performance) is lower censored at 2 and upper-censored at 4. Moreover, since khat use can be endogenously determined, we include its predicted values from the logit model estimation as explained in method section. The results are presented in Table 4. The first column is for cumulative GPA while the second one is for semester GPA.

The regression results indicate that khat use has indeed a statistically significant negative effect on academic performance (CGPA). More specifically, if a non-khat using student becomes khat user, his/her CGPA and SGPA decreases by 0.81 and 0.74 respectively. Both are statistically significant at 1%.

The coefficient for past academic performance (entrance exam score) is statistically significant at 10% for CGPA and 1% for SGPA. This means that a one unit increase in the score obtained in entrance exam results

in a 0.002 points increase in the predicted value of the CGPA. Thus, students' academic performance at university level is strongly associated with past academic performance at preparatory level. This is in line with what is normally expected and with previous findings (Birch and Miller, 2005; Win and Miller, 2005; Johnes and McNabb, 2004; Johnes, 1997). Thus, preparatory level education is vital in terms of enhance the performance of students in higher learning institutions.

With regard to gender, male students were found to be better performers. Past studies have reported inconclusive results with many reporting that male students attain higher grades than their female counterparts (Anderson et al., 1994; Robb and Robb, 1999; Tay, 1994); while others reporting the opposite especially in developed countries (Bailey and Dynarski, 2011; Win and Miller, 2005; Dancer and Fiebig, 2004) and still others reporting no significant gender difference (Borg and Stranahan, 2002; Hoefer and Gould, 2000; Marcal and Roberts 2000). However, in developing countries like Ethiopia, female students are likely to face challenges during their early schooling as they are expected to be involved in house chores more frequently than their male counterparts. This might have a negative influence in their academic attainment at later stages of their schooling. Our results lend support to this fact.

Parental education, in particular, education of the head was also found to have a positive and significant influence on students' academic performance. In particular, students whose parents have completed grade 12 or higher performed better than their counterparts from illiterate families as measured by CGPA (column 1). That is, the predicted value of CGPA is 0.28 point higher for students whose household heads have attained grade 12 or higher compared to those whose household heads are illiterate (our reference group). However, the other categories of educational levels of household heads are not statistically significant compared to illiterate household heads. This result is in agreement with theory of human capital formation and past empirical findings in many studies that assessed the impact of household education on children's educational attainment.

As was already shown in Figure 2, among the khat-using students, the heavy users are the most affected. In line with this observation, we have repeated the regression analysis in Table 4 using frequency (extent) of khat use in place of khat-use variable. The results are given in Table 5.

Focusing on the variable of interest (extent of khat use), we see that both medium users and heavy users had significantly lower grades in terms of Cumulative GPA, with the magnitude for heavy use being larger. For semester GPA, medium users were found to perform better (on average attaining 0.437 points higher) compared to light users; however there was no statistically significant difference among heavy users vis-

à-vis light users.

Finally, we have attempted to check if the perceived benefit of khat in enhancing performance had any impact on actual performance of students by including the perception that khat use enhances academic performance as an explanatory variable in our academic performance model. As was pointed out in the previous subsection, perceived benefit from khat in terms of enhancing performance was one of the major factors associated with the probability of khat use. The results are presented in Table 6.

The effect of khat use remains negative and significant. Perception about (the positive) impact of khat use on academic performance was not found to have any influence on CGPA, but it had a significant positive influence on SGPA. This is possibly related to the fact that CGPA measures a long-term academic performance, while SGPA measures a short-term academic performance. Consequently, if a student is not addicted to khat and perceives that it can help improve a short-term academic performance, he/she will use khat strategically.

In summary, khat use has negative impact on academic performance. However, among students who are users, it's the heavy users that are affected the most, while light users were relatively better performers. This is in line with previous findings that the impact of khat is dose-dependent especially in the fields of medical health and pharmacology (Nyachio et al., 2012; Nyongesa et al., 2008). However, this needs further research especially in the case of performance. Taken together with the fact that khat use has negative impact, it can be concluded that khat use is detrimental for academic performance and that even among users, the more one consumes the more harm is done to students' performance.

Conclusion

In this paper we examine the determinants of khat use and its impact on academic performance of undergraduate students at Jimma University. Our results indicated that students who are male, whose family occupation is trade, who come from khat growing areas and who have relationship with khat user are significantly more likely to use khat. Furthermore, khat use had a significant negative effect on students' academic performance and that such impact is increasing with the extent or dose of khat use. Other important determinants of academic performance included students' past academic attainment, student's sex, occupation of household head, and education level of household head (specifically grade 12 or higher level). Finally, perceived benefit of khat in terms of enhancing performance was found to be positively associated with semester GPA.

Based on the result of our study, the following recommendations can be made. First, there should be

Table 5. Impact of khat-use frequency on academic performance (tobit model).

	CGPA		SGPA	
	Coef.	S.E	Coef.	S.E
Khat use frequency				
<i>Medium use</i>	-0.446***	(0.121)	0.437	(0.259)
<i>Heavy use</i>	-0.676***	(0.181)	0.191	(0.165)
Gender	0.293	(0.237)	0.311	(0.215)
Log of head's age	-0.190	(0.319)	-0.833	(0.293)
Head's gender	-0.255**	(0.115)	0.025	(0.114)
Head's occupation				
<i>Gov. employee</i>	0.181	(0.216)	-0.336	(0.228)
<i>Trader</i>	0.387**	(0.147)	0.174	(0.159)
<i>Others</i>	-0.128	(0.213)	0.248	(0.368)
Head's education				
<i>Read and write</i>	0.342*	(0.182)	0.840***	(0.195)
<i>Grades 1-4</i>	0.094	(0.227)	0.134	(0.218)
<i>Grades 5-8</i>	2.126***	(0.510)	1.917	(0.356)
<i>Grades 9-12</i>	0.159	(0.209)	0.662**	(0.205)
<i>Over grade 12</i>	0.284	(0.255)	0.426*	(0.232)
Mother's education				
<i>Read and write</i>	-0.214	(0.239)	0.696	(0.649)
<i>Grades 1-4</i>	0.469	(0.280)	0.317	(0.212)
<i>Grades 5-8</i>	0.043	(0.206)	-0.366	(0.232)
<i>Grades 9-12</i>	0.290	(0.211)	-0.223	(0.233)
<i>Over grade 12</i>	0.235	(0.210)	-0.447	(0.267)
University entrance score	0.0008	(0.0019)	0.0038***	(0.0010)
Log of family size	0.059	(0.158)	0.259	(0.189)
Log of pocket money	0.388**	(0.148)	-0.170	(0.229)
Constant	0.189***	(0.020)	7.317***	(1.248)
No. of observation	52		59	
pseudo R2	0.994		0.987	

Notes: Included but not reported are dummies for department and religion. ***p<0.01, **p<0.05, *p<0.10

Table 6. Perception about khat use and academic performance (tobit model).

	CGPA		SGPA	
	Coef.	S.E	Coef.	S.E
Predicted khat use	-0.861***	(0.138)	-0.749***	(0.171)
Khat enhances performance	0.068	(0.079)	0.166*	(0.099)
Gender	0.679***	(0.120)	0.468***	(0.142)
Log of head's age	-0.066	(0.207)	-0.405*	(0.212)
Head's gender	-0.018	(0.079)	0.040	(0.096)
Head's occupation				
<i>Gov. employee</i>	0.025	(0.129)	-0.042	(0.144)
<i>Trader</i>	0.099	(0.107)	0.007	(0.127)
<i>Others</i>	0.401**	(0.178)	0.289	(0.235)

Table 6. Cont'd

Head's education				
<i>Read and write</i>	-0.051	(0.133)	0.019	(0.162)
<i>Grades 1-4</i>	0.042	(0.152)	-0.125	(0.178)
<i>Grades 5-8</i>	0.183	(0.124)	0.138	(0.149)
<i>Grades 9-12</i>	0.115	(0.142)	-0.0582	(0.181)
<i>Over grade 12</i>	0.453***	(0.158)	0.259	(0.194)
Mother's education				
<i>Read and write</i>	0.187	(0.123)	0.176	(0.160)
<i>Grades 1-4</i>	-0.107	(0.126)	-0.019	(0.157)
<i>Grades 5-8</i>	0.268*	(0.120)	0.355**	(0.146)
<i>Grades 9-12</i>	0.105	(0.132)	0.012	(0.164)
<i>Over grade 12</i>	-0.015	(0.153)	-0.137	(0.198)
University entrance score	0.002**	(0.0009)	0.002***	(0.0007)
Log of family size	0.228*	(0.118)	0.155	(0.159)
Log of pocket money	0.004	(0.094)	0.021	(0.117)
Constant	2.040*	(0.828)	3.761***	(0.997)
No. of observations	101		115	
pseudo R2	0.794		0.372	

Notes: Included but not reported are dummies for department and religion. ***p<0.01, **p<0.05, *p<0.10

awareness creation among students about the negative consequences of khat use on academic performance. Second, there has to be a concerted effort to improve the quality of education being offered at preparatory level (the level of education between the general secondary education certificate examination and higher education entrance examination in the current Ethiopian education system). This responsibility goes to governments at all levels i.e., local, regional as well as federal.

It would be of great interest to understand the pathways through which khat use actually affects students' academic performance, an issue not addressed in the current study owing to its scope. This would have an important implication to gain an understanding of the possible causality between khat use and academic performance. It would also of help to policy makers and the university management in addressing issues related to university students' academic achievements. This can be another interesting area for future research.

Conflict of Interests

The authors have not declared any conflict of interests.

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