Student time allocation and self-rated performance – Evidence from a sample survey in Sicily (Italy)

Massimo Mucciardi

Assistant Professor Massimo Mucciardi
Department of Economics, Statistics, Mathematics and Sociology
University of Messina
Messina, Italy
e-mail: mucciard@unime.it

Abstract

The paper collects the results of a survey performed in 2010 aimed at analysing how high school students in the province of Messina in Sicily (Italy) spend their time. Principally, is analyzed the interaction between use of time, scholastic performance and time dedicated to study. So, we propose an estimation model for the daily study-time of students. From a methodological point of view, using a two stage regression procedure to estimate self-rate performance (S_{rpe}) and time devoted to study (T_{stu}) allows to correct the estimates by simultaneity effects between these variables. In the first stage, the self-rate performance at school is estimated in a reduced form and is used as a proxy of scholastic performance in the second step. Next, we run an ordinal regression in order to estimate the hours dedicated to study declared by the student. The results obtained show that students with a high expected value of study-time come from lyceum, they are mostly females, and tend to read more. Furthermore, they have satisfactory scholastic performance, are helped by their mothers when they do their homework, have a lower-than-average age difference with their mothers, but a higher-than-average age difference with their fathers.

JEL-Codes: C13; C30; C36

Keywords: Study-time; Use of time; Self-rate performance; Two stage regression procedure; High school

1   Introduction

Most of the previous studies on the effect of performance and time devoted to study have been very focused. Schmidt (1983) analyzes a survey sample of 216 students at the University of Wisconsin-Madison and estimates a Cobb-Douglas educational production function using both Ordinary Least Square and Full Information Maximum Likelihood methods. He finds an elasticity of performance with respect to hours of class attendance of 0.215 and of study hours of 0.017. Romer (1993) considers the class attendance as an endogenous factor and tries to correct the endogeneity effect by introducing some proxies for motivation in the estimates of the performance function. Bratti and Staffolani (2002) consider the students' performance as a direct consequence of the allocation between time devoted to study and leisure time. Dolton, Marcenaro and Navarro (2003) find that the lectures are four times more productive than self-study. As pointed out by Olivares (2002), the study time-grade association literature has provided inconsistent findings: some researchers have found a positive association, others a negative association, and yet others no association between study time and grades. Unlike the academia, high school students are obliged to attend the lessons. This implies that lessons attendance can be unable to explain student's performance. On the other hand, several factors can influence the high school students' performance; in general, the level of the grades may depend on the time devoted to study and vice-versa, even if this relation may be influenced by other factors such as the different courses of study, the efficiency of the teachers, and environmental and motivational factors.

In light of these considerations, this paper collects the results of a survey performed in 2010, aimed at analysing how high school students in the province of Messina in Sicily (Italy) spend their time. The main purpose of research is to understand the relationship between use of time, self-rated performance (proxy of scholastic performance) and time devoted to study (study-time). So we propose an estimation model for the daily study-time of students. From a methodological point of view, using a two stage regression procedure to estimate self-rated performance (S_{rpe}) and time devoted to study (T_{stu}) allows to correct the estimates by simultaneity effects between these previous variables. The paper outline is as follows: in the next section we present the research model and the data utilized; in the third, we deal with the problem of the estimation model used for the study-time, and in the last section we discuss the main results obtained and on the possible ways the research may be developed.

2   The research model and data

The research model used is based on a study performed by Sabbadini and Palomba (1994) on the use of time by men and women. We divided the students' time into 4 categories: "physiological activities", "activities for the family", "study" and "leisure time". We interviewed about

1800 students from various types of public educational institutions[1] (Lyceum, Technical institute and Vocational school), using a specially drawn-up questionnaire (see table 1 for sample features).

Table 1
Sample features

Variable	Students
Gender	
Male	865 (47.5%)
Female	955 (52.5.%)
Age	
Mean (SD)	16.87 (1.55)
Ethnicity	
Italian	1827 (100%)
Type of school	
Lyceum	798 (43.7%)
Technical institute	751 (41.1%)
Vocational school	278 (15.2%)
Year attended	
1st	474 (25.9%)
2nd	341 (18.7%)
3th	368 (20.1%)
4st	400 (21.9%)
5st	245 (13.4%)

n=1827, Source: Own performed survey 2010,
own calculations.

The sampling plan takes into account the percentage and geographical distribution of educational facilities in the province of Messina in Sicily (Italy). With regard to the questionnaire used for the research, students first completed the section on personal and family details, and, later, the specific sections on the "use of time". The analysis was performed using the "overall average duration" of each activity during a standard day. To this purpose, we also considered an indicator of frequency (every day/3-5 times a week/1-2 times a week/1-2 times a month/never) for all the activities except physiological activities and study (see table 2). The questionnaire was self-compiled, but under the supervision of expert testers. Furthermore, detailed information on family composition, educational level and working activity of parents are

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[1]   It is important to highlight that education in Italy is compulsory from 6 to 16 years of age, and is divided into five stages: Kindergarten, Primary School, Lower Secondary School, Upper Secondary School (which corresponds to the High-School level) and University. In particularly, the Upper Secondary School situation varies, since there are several types of schools differentiated by subjects and activities. The main division is between the "Lyceum", the "Technical Institute" and the "Vocational School". Any kind of Upper Secondary School that lasts 5 years (age 14 to 18) grants access to the final exam. This exam grants access to University.

considered. Sadly, for confidentiality reasons, it was not possible to detect the students' grade point average.

Table 2
Average distribution of time during the typical day of a student

Activity	Time		Frequency of activity (%)				
			Every day	3-5 times/ week	1-2 times/ week	1-2 times/ month	Never
Sleep (night and/or afternoon)	8 h	7 min	*100.00*	-	-	-	-
Personal hygiene and bodily care	1 h	20 min	*100.00*	-	-	-	-
Eating breakfast	0 h	13 min	*70.63*	-	-	-	*29.37*
Eating lunch	0 h	40 min	*99.86*	-	-	-	*0.14*
Eating the evening meal	0 h	41 min	*99.54*	-	-	-	*0.46*
Housework	1 h	5 min	*29.74*	*16.04*	*29.19*	*6.66*	*18.38*
Shopping	0 h	31 min	*3.34*	*10.28*	*32.99*	*16.20*	*37.20*
Looking after younger brothers/sisters	0 h	22 min	*10.70*	*2.93*	*3.93*	*1.89*	*80.56*
Work outside the family	0 h	39 min	*5.49*	*3.04*	*5.58*	*3.25*	*82.64*
Other family activities	0 h	10 min	*2.21*	*0.84*	*0.65*	*0.15*	*96.17*
Time spent travelling to and from school	0 h	51 min	*100.00*	-	-	-	-
Time spent at school	5 h	44 min	*100.00*	-	-	-	-
Study at home	2 h	33 min	*100.00*	-	-	-	-
Sport and gym	1 h	13 min	*10.42*	*28.60*	*19.86*	*2.45*	*38.67*
Watching television	2 h	9 min	*87.50*	*7.28*	*2.19*	*0.06*	*2.97*
Listening to music	1 h	44 min	*64.87*	*19.04*	*11.41*	*1.09*	*3.59*
Use of computer and the internet	1 h	5 min	*23.97*	*19.32*	*20.91*	*5.35*	*30.45*
Going out with friends	2 h	53 min	*31.80*	*24.96*	*34.54*	*2.43*	*6.26*
Reading (not school books)	0 h	31 min	*6.27*	*10.51*	*15.35*	*19.77*	*48.10*
Reading newspapers or comics	0 h	24 min	*11.52*	*11.34*	*23.84*	*10.59*	*42.70*
Going to the cinema or theatre	1 h	20 min	*0.41*	*1.03*	*10.54*	*52.12*	*35.90*
Going dancing (dancing school, disco)	1 h	25 min	*1.48*	*3.04*	*15.53*	*24.74*	*55.21*
Games arcades, playing cards, playstation	0 h	48 min	*12.74*	*15.07*	*17.01*	*7.84*	*47.34*
Painting, playing musical instruments, crafts	0 h	24 min	*4.70*	*3.90*	*6.98*	*7.84*	*76.59*
Voluntary work and parish activities	0 h	22 min	*1.26*	*1.84*	*10.84*	*4.54*	*81.52*
Other 1	0 h	6 min	*0.97*	*0.98*	*1.10*	*0.52*	*96.43*
Other 2	0 h	1 min	*0.17*	*0.15*	*0.14*	*0.20*	*99.34*

Source: Own performed survey 2010, own calculations.

Thus the problem of the measurement of scholastic performance was solved by asking the students a synthetic judgment on their subjective satisfaction about their own scholastic out-

comes[2]. This implies that the performance of each student is classified as a dichotomous variable (satisfactory/ unsatisfactory). We called this proxy variable self-rated performance (S_{rpe}).

3 Estimation procedure[3]

As noticed in the introduction, we used a well-known technique (Green, 2000) to estimate self-rated performance (S_{rpe}) and the study-time (T_{stu}) so as to correct the estimates by simultaneity effects between these variables. So the model used to estimate the time devoted to study involves a two-stage regression procedure[4]. In the first stage, the student's self-rated performance (P_{stu}) at school (satisfactory/unsatisfactory) is estimated in a reduced form, and is used as a proxy of scholastic performance in the second step.

Then in the first stage we applied a logistic regression:

(1) $$S_{rpe} = f\left(F_{spo}, P_{ide}, M_{eds}, F_{prs}, T_{pla}, T_{dan}, T_{out}\right)$$

where F_{spo} = frequency with which the student practises sport or goes to the gym (every day/3-5 times a week/1-2 times a week/1-2 times a month/never); P_{ide}= proxy of the type of student (highly idealistic/idealistic/concrete); Meds= mother's educational level (high/medium/low); F_{prs} = father's professional status (high/medium/low); T_{pla}=time devoted to playing at a games arcade; T_{dan}=time devoted to going dancing and Tout=time spent outside with friends. As a research hypothesis we assumed that these variables were exogenous. The student's self-rated performance explained by the regression (1) was used as an instrumental variable in the second stage. So we run an ordinal regression model (McCullagh, 1980) in order to estimate the hours devoted to study (T_{stu}) declared by the student (over 4 hours/between 3 and 4 hours/between 2 and 3 hours/between 1 and 2 hours/less than one hour):

(2) $$T_{stu} = f\left(D_{fag}, D_{mag}, S_{rpe}^{*}, T_{rea}, T_{sch}, G_{stu}, Y_{att}, M_{hel}\right)$$

where D_{fag} = difference between the student's and his/her father's age, D_{mag} = difference between the student's and his/her mother's age, S*$_{rpe}$= theoretical values of the student's self-rated performance, explained by (1), T_{rea} = time devoted to reading non-scholastic books; T_{sch} = type of school (Lyceum/Technical institute/Vocational school), G_{stu} = student's gender (male/female), Y_{att} = year attended (1st-5st) and M_{hel} = mother's help with study (yes/no).

In an ordinal regression model, various "link" functions may be used. In this case, the logit function ensured the best fit. The output of an ordinal regression gives the probability that a generic unity falls between the categories of the response variable: in this way we obtained the expected value of study-time for each unit (student).

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[2] It seems useful to point out that the question was referred to the whole of the teachings studied and was not related to the overcoming of the school year.

[3] All analyses were performed using SPSS 16.0 and Excel 2003.

[4] Among the various models examined the regressions (1) and (2) have provided the best performance according to the theory of "two-stage regression procedure". (For more details see Green and Wooldridge).

4   Main results

An average, high school student in the province of Messina (Italy) spends his/her standard working day as shown in table 2. The most interesting outcome seems to be that students spend around 84% of their time performing daily activities, while the remaining 16% is devoted to leisure time or (rather irregular) family activities. The proportion spent studying is 11% if referred to the entire day, or 13% if referred only to daily activities.

Let us now examine the results of equation 1 and 2 (table 3-4).

Table 3
Results of the logistic regression (first stage)

Variables	Coeff.	Sd.Err.	P-value
Constant	.685	.233	.003
F_{spo}			.006
3-5 times at week	.325	.204	.111
1-2 times at week	.461	.151	.002
1-2 times at month	.527	.168	.002
Never	.760	.503	.130
Every day (ref.) every day			
P_{ide}			.000
Highly idealistic	1.086	.163	.000
Idealistic	1.065	.164	.000
Concrete (ref)			
M_{eds}			.008
Low	-.235	.181	.195
Medium	-.465	.154	.003
High (ref.)			
F_{prs}			.000
Low	-.669	.222	.003
Medium	-.503	.131	.000
High (ref.)			
T_{pla}	-.169	.058	.004
T_{dan}	-.098	.033	.003
T_{out}	-.121	.037	.001

Note: S_{rpe} =1 if the personal assessment of the performance is satisfactory,
S_{rpe} =0 if the personal assessment of the performance is unsatisfactory
Sample size = 1439; Nagelkerke R Square = 0.15; goodness of fit Chi^2 (13) = 149
p-value = 0.000, Hosmer-Lemershow test = 8.494 p-value = 0.387
Ref. =reference category
Source: Own performed survey 2010, own calculations.

From the first stage estimate (logistic regression) it emerges that students who display satisfactory performance (S_{rpe}) have mothers with a high educational level and fathers with a high professional status.

Table 4
**Results of the ordinal regression (second stage)**

Variables	Coeff.	Sd.Err.	P-value
$1<T_{stu}<=2$	.864	.409	.035
$2<T_{stu}<=3$	2.608	.415	.000
$3<T_{stu}<=4$	4.030	.422	.000
$T_{stu}>4$	5.215	.430	.000
S^*_{rpe}	2.152	.372	.000
D_{fag}	.049	.015	.001
D_{mag}	-.037	.016	.018
T_{rea}	.572	.072	.000
Ytt (1st)	-.381	.175	.030
Yatt (2nd)	-.894	.185	.000
Yatt (3th)	-.556	.181	.002
Yatt (4st)	-1.162	.183	.000
Yatt (5st) (ref)	0	.	.
Gender (male)	-1.232	.110	.000
Gender (female) (ref.)	0	.	.
T_{sch} (lyceum)	1.978	.187	.000
T_{sch} (technical institute)	1.071	.176	.000
T_{sch} (vocational school) (ref.)	0	.	.
M_{hel} (Yes)	.366	.104	.000
M_{hel} (No) (ref.)	0	.	.

Note: Dependent variable =1 if $T_{stu}>4$; 2 if $3<T_{stu}<=4$, 3 if $2<Tstu<=3$;
4 if $1<T_{stu}<=2$ and 5 if $T_{stu}<=1$,
Sample size = 1440; Nagelkerke R Square = 0.37; goodness of fit Chi^2 (12) = 579 ,
p-value = 0.000, Ref. =reference category,
Source: Own performed survey 2010, own calculations.

Moreover, they are highly idealistic, play little sport, on average, tend to spend little time in discos and games arcades, and go out with their friends only rarely (see first stage, table 3). Ordinal regression (second stage, table 4) shows that students with a high expected value of study-time (T_{stu}) come from lyceums, they are mostly females, and tend to read more. Furthermore, they have satisfactory scholastic performance, are helped by their mothers when they do their homework, have a lower-than-average age difference with their mothers, but a higher-than-average age difference with their fathers. The year attended plays an interesting role. In fact, students attending the 1st, 3nd and 5th year have an expected value of study-time higher than students in their 2rd and 4th years: this tends to confirm the importance of 'transition years'. Having obtained the estimates it is possible to suitably modify the variables of interest and ex-

trapolate various profiles of study-time (T^{stu}) by simulating hypotheses such as the provenance from different schools, the self-rate performance and the year attended (see figure 1).

Figure 1
Study-time (T_{stu}) vs self-rate performance (S_{rpe}) analyzed for different schools
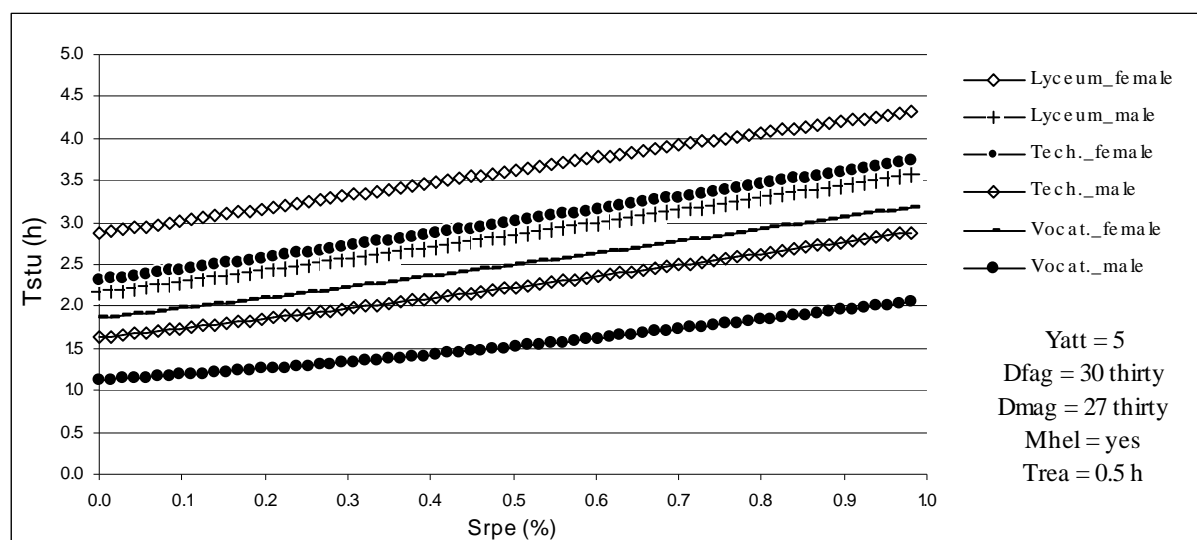
Source: Own performed survey 2010, own illustration.

As one can see, the gender and type of school strongly influence the relationship between student's self-rated performance and study-time.

5   Conclusion

The present research sought to better understand the nature of the self-rated performance and study-time by examining the effects of the student time allocation, individual characteristics of the students and some socio-demographic characteristics of the parents. In order to do so, we have introduced a two-stage regression procedure for the student's self-rated performance and student time allocation. Although most of the work reported in the literature concerns the context academic (Olivares, 2002), the results obtained in this study seem to confirm that the satisfaction in school performance is a good predictor of the study time. Respect to previous studies, we identify new predictors such as gender of the student, type of school attended (proxy of the course difficulty) and time devoted to reading non-scholastic books. However, we believe that the model proposed and the results obtained should also be evaluated in relation to the empirical nature of the study and the geographical context. In fact there is a high risk that inaccuracies may occur in this type of sample survey especially in terms of the exact measurement of the timing of the daily, weekly and monthly activities. As mentioned above, the survey is missing some important variables such as the characteristics of the teachers (teacher effectiveness) and student's grades. We consider this work as a pilot study therefore, we aim at replicating this

survey in other scholastic contexts in order to validate the results obtained. A study of this kind is currently in progress by the author.

References

Bratti, M. and S. Staffolani (2002), Student time allocation and educational production function, Working Paper No. 170, Department of Economics, University of Ancona (Italy).

Dolton, P., Marcenaro, O. and L. Navarro (2003), The effective use of student time – A stochastic frontier production function case study, in: *Economics of Education Review*, Vol. 22, No. 6, 547-560.

Greene, W. H. (2000), Econometric Analysis, Prentice-Hall.

McCullagh, P. (1980), Regression models for ordinal data, in: *Journal of the Royal Statistical Society, Series B*, Vol. 42, No. 2, 109-142.

Olivares, O. J. (2002), An analysis of the study time-grade association, Radical Pedagogy, CAAP.

Romer, D. (1993), Do students go to class?, in: *The Journal of Economic Perspectives*, Vol. 7, No. 3, 167-174.

Sabbadini, L. and R. Palomba (1994), Tempi diversi – L'uso del tempo di uomini e donne nell'Italia di oggi, Italian Institute of Statistics (ISTAT).

Schmidt, R. M. (1983), Who maximizes what? – A study in student allocation, in: *American Economic Review*, Vol. 73, No. 2, 23-28.

Wooldridge, J.M. (2002), Econometric Analysis of Cross Section and Panel Data, MIT Press.