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Research Article

The Effect of the Medium of Instruction Language on the Academic Success of University Students

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Abstract

The aim of this study is to investigate the effects of instruction in students' non-native language on the academic success of university students. To analyze this effect, we utilized the data from a Turkish university with many departments that offer the same bachelor degree programs both in English and in Turkish. All other aspects of the programs were assumed to be identical and students had very similar academic and socioeconomic backgrounds in both degree programs. Our analysis indicated that instruction in the non-native language affects negatively the academic success (i.e., semester point average) of students. This negative influence was higher in the first year but still existed by the fourth year. However, we found the opposite effect for the students with merit-based scholarships, who are arguably brighter and self-motivated. We should note that we were not measuring the benefits of English-medium instruction. Thus our results do not automatically imply that English-medium instruction is harmful to the students.

Keywords

Language of instruction • Academic success • University • Turkey

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In the last two decades the use of English as the medium of instruction in Turkish universities increased significantly. Many "prestigious" Turkish universities such as Boğazici University, Middle East Technical University, and Bilkent University have employed English language instruction for a long time. However, many "highly prestigious" and "other" universities switched to English? Moreover, almost exclusively all new foundation (non-public) universities use English as their language of instruction. Evidence suggests that this higher education trend is not unique to Turkey but is rather a global one. In many countries around the world a language other than the students' mothers' tongue is used in primary, secondary, and tertiary education. This trend is deeper and more widespread in underdeveloped and developing countries. However even in many developed countries, including European countries, higher education is "Englishized" (Phillipson, 2008).

Brumfit (2004) stated that European universities have significantly internationalized by offering courses, modules, and complete degrees taught in English. According to Wachter and Maiworm (2008), in 2007 more than 400 European higher education institutes provided more than 2,400 programs taught entirely in English, a 340 per cent increase since 2002. Kırkgöz (2007) revealed the rising importance of English in Turkey in her study on the development of English language teaching and outlined the policy changes in the Turkish education system.

The goal of becoming a global or international university is one of the main drivers of use of English. Ritzen (2004, p. 36) stated that it is not possible to be a true international university without attracting students from a wide range of cultures and nations. One way for universities in non-English-speaking countries to compete with their counterparts in English-speaking countries is to include English-medium instruction in their academic offer. Doiz et al. (2011) stated that it is indeed the case for many Asian and European universities. According to the authors, the introduction of teaching in English has improved the attractiveness of many European universities, and English has become the academic lingua franca in European higher education. This trend is further fueled by wildly popular student and faculty mobility programs, including "Erasmus," sponsored by the European Commission. Yang (2002) indicated that the use of English is also seen as one of the most substantial factors influencing the internationalization of many Chinese universities. Kurtan (2004) extended this idea by suggesting that, in the globalized higher education space, internationalization is necessary even to attract domestic students. Graddol (2006) concluded that globalization of universities is one of the main drivers of globalization of English.

Doiz et al. (2011) summarized the goal of using English as the language of instruction as follows:

- to attract international students;
- to prepare domestic students for the global labor market;
- to raise the profile of the institution.

We can add following to this list:

- to attract international faculty members;
- to facilitate domestic students' attendance to postgraduate degrees abroad;
- to improve domestic students' general English skills for the labor market (domestic and global).

Theoretically, both negative and positive influences of English-medium instruction on the academic success of students are possible. One advantage of instruction in English is the higher quality of support materials compared to those in local languages. Textbooks, articles, support websites, practice questions are better in both quality and quantity in English than in any other language. Students and faculty members can improve the quality of education by using these materials. Conversely, if the students and faculty members' levels of English are not adequate, the lectures and other education activities might be less effective than they would be in the local language. That is especially relevant for Turkey at which there are some worries about the quality of teaching staff (Owings et al., 2012). So, the issue can be resolved with empirical studies.

Although the use of English is becoming more widespread, the concerns about the potential negative effects on students' academic achievements and effects on learning process itself have not been resolved. There is a growing literature on that issue and general conclusion of these studies is that academic outcomes are negatively influenced when the medium of instruction is a language other than the mother tongue of the students.

Here we study the impact of medium of instruction language on the academic success of Turkish university students. Normally analyzing the effect of medium of instruction on academic outcomes is very difficult because usually students receiving English-medium and Turkish-medium education have different personal traits and socioeconomic backgrounds. Many of those differences are unobservable in regular datasets; however, our method provides a very useful approach to parse out these effects. We utilized the data from a foundation university in Istanbul, Turkey. The university offers degree programs in both English-medium and Turkish-medium. The curriculum of these two types of program are identical, most academic staff teach both types of programs and the socioeconomic backgrounds of the students in both types of programs are very similar. We conclude that the English-medium instruction lowers the academic success

of students, especially during freshman and sophomore years. This result is robust even when we account for many other potential factors affecting academic success of the students. However, for scholarship students, who are generally brighter and more motivated, the English-medium instruction improves academic success.

The rest of the paper is organized as follows. Part II provides a brief literature review; part III explains data sources and methodology. Part IV presents results and discussion. Part V concludes.

Literature Review

Academic success of students depends on many factors. Intelligence of the student is one of the most important factors in school success. Past research has shown that intelligence is a good predictor of academic success (Elshout & Veenman, 1992; Stenberg & Kaufman, 1998, Stinebrickner & Stinebrickner, 2008). Many other studies have proved that, in addition to intelligence, personality traits of the students have a strong impact on academic outcomes (Allik & Realo, 1997; Dollinger & Orf, 1991; Premuzic & Furnham, 2003).

Language skill is another important factor influencing academic success. Murray (2012) reported that the weak language skills of students have become a problem even for Australian students. Even though the official and predominant language in Australia is English, the language skills of minority students and international students became an issue such that a national symposium was convened in 2007 by the Australia Education International (AEI) and the International Education Association of Australia. As a result of this symposium, a document on the good practice principles for English language competence for international students in Australian universities emerged. If weak language skills create problems for students in Australian universities where the academic staff are fluent in English and students experience English off-campus in their daily lives, presumably it would create much bigger problems in countries where English is not used off-campus and the fluent language skills of academic staff are also limited.

The relationship between language proficiency and academic success is well documented. Students whose language proficiency levels are not adequate have difficulty in grasping the subject matters. (Maleki & Zangani 2007). Many researchers found that students who are more proficient in the instruction language are on average more successful (Adbirahman et al., 2013; Arsad et al., 2014; Fakeye, 2009; Kumar, 2014; Sadegi et al. 2013). Conversely, Cekiso et al. (2015) did not find any statistically significant correlation between language proficiency and success on other academic courses.

Thogersen and Airey (2011) studied qualitative and quantitative data in a Danish university and found that the same instructors speak more slowly in English lectures than in Danish lectures, and it takes longer to present the same material in English. More importantly the professors use a more formal style in English lectures while in Danish lectures they use a rhetorical style and more daily life examples to convey scientific ideas. In their studies of students in the Netherlands, Vinke (1995) and Klaassen (2001) observed that English-medium instruction results in less interactive and more monological lectures. Airey and Linder (2006; 2007) concluded similar results for Sweden; students asked and answered fewer questions in English-medium lectures. Bretag (2007) and Sawir (2005) argue that the inadequate levels of communicative competence of students in English force academic staff to tone down and adjust their course content and lecture style to make it more accessible to students. Similar results have been found in developing country contexts. Loa and Macaro (2012) studied secondary school students and observed that lessons in English tended to become more teacher-centered, with students' participation being more inhibited than during lessons in Chinese. Kinyaduka and Kiwara (2013) documented that teachers (78%) believe English-medium instruction to be a setback to students' academic success. In the same study 65% of students stated that they could not understand the subject matter when the lectures are in English. But the majority of students, parents, and teachers still prefer English over local languages. Kırkgöz (2009) drew attention to the inadequacy of foreign language skills taught in preparing for the academic requirements in Turkey in English-medium universities. Sert (2008) also mentioned the inefficiencies and difficulties both in English-medium and English-aided instructions in Turkey. Ng, Tsui, and Marton (2001) found that in China, in Chinese-medium lessons the teacher could shift often and easily between abstract scientific concepts and concrete real-life examples, while in English-medium lessons these instances were rare. In another study about China, Yip, Coyle, and Tsang (2007) reported that the English-medium lessons were much more "transmission-oriented" with little discussion. Brock-Utne (2012), Mwinsheikhe (2001) and Vuzo (2007) reported similar observations in Africa.

There are also some studies showing the negative impact of English-medium instruction on academic outcomes. Mekonnen (2005; 2009) found that primary students educated in their mother tongue obtained higher scores on mathematics and sciences than those educated in a non-native language. Similarly a study by the Education Department of Hong Kong (1994) concluded that students learning through Chinese outperformed those learning through English in science, geography, and history. Marsh, Hau, and Kong (2000) found that English-medium instruction had considerable negative effects on geography, science, and world history. The Education Bureau (2006) found similar differences in economics, geography, history, physics, chemistry, biology, and mathematics. However, these studies also found out

no significant differences in the later years of those students educated in English-medium instruction schools. This implies that English-medium students catch up once they go over a linguistic threshold. Moreover, Marsh, Hau, and Kong (2000), and Tsang (2004) observed that English-medium students have higher English skills than Chinese-medium students.

Conversely, Ballantine and Rivera (2014) examined the performance of International Baccalaureate Diploma Programme (IBDP) candidates who took examinations in a language other than their native one. They found that students who took the exams in a non-native language (the majority for whom the school courses were also conducted in a non-native language) were more successful than others. However, their method does not allow them to separate other factors influencing exam performance.

What then explains the increasing prevalence of English-medium instruction? Even though this question is beyond the scope of this paper, we suggest several potential answers. As mentioned in the introduction, attracting international and even domestic students might be easier with English-medium instruction. For one, overall English skills might be more important than students" proficiency in academic subjects. Studies cited above and many others show that English-medium instruction improves students' English level at least in the long run. Brock-Utne (2012) mentions a student in Tanzania who had great difficulty understanding lectures in English and nevertheless refused instruction in Tanzania's local language Kiswahili, because he believed that English is the language of science and technology and modernization and development. The same mindset is also common among policy makers in developing countries. Rugemalira et al. (1990) states that:

"It should be demonstrated that countries such as Finland, Norway, China or Japan, which do not teach their children through the medium of an "international language" are isolated and have lost track of technological developments beyond their borders" (Rugemalira et al., 1990, p.31).

Finally, English-medium instruction can be the means to preserve the status of elites. Mahinda Ranaweera, the former Director of Education at the Curriculum Development Centre, Ministry of Education, Sri Lanka, explains this from the reverse angle. In his account of the advantage of switching from English medium to Sinhala and Tamil medium, he wrote about the great on science education:

"[T]he transition from English to the national languages as the medium of instruction in science helped to destroy the great barrier that existed between the privileged English educated class and the non-English educated deprived classes; between the science educated elite and the non-science educated masses; between

science itself and the people. It gave confidence to the common man that science is within his reach and to the teachers and pupils that a knowledge of English need not necessarily be a prerequisite for learning science" (Ranaweera 1976, p. 423).

Data and Methodology

Data

In order to test the effect of medium of instruction on the academic success of university students, we used data from a foundation (private) university in Istanbul. Many departments at the university have two degree programs—in English and in Turkish—both curriculums of those programs are identical to each other. Most professors teach the courses in both degree programs; and the students in both programs use the same physical and academic facilities (computer labs, library, auditoriums, etc.). The academic and socioeconomic backgrounds of students in both programs are very similar. Basically the only significant difference between these programs is the language of instruction: Turkish is the native language of the students and the other language is English. Although there are a small number of non-Turkish professors who do not offer courses in Turkish language degree programs, we do not expect this to cause a substantial problem. This provides a semi-natural experiment to test the influence of instruction in a student's non-native language on the academic success.

The data of students from nine departments are used. The students entered the university in 2005–2006, and their semester point averages (SPAs) between 2005 and 2010 are used in the analysis. The departments in question are mathematics, physics, chemistry, computer engineering, electronic engineering, environmental engineering, economics, and management, and had both English and Turkish degree programs at that time. The dependent variable in our analysis is the SPA of students. It could be argued that SPA does not accurately indicate the academic success of the students. Many students who are bright and motivated do not get high SPAs, perhaps because they do not perform well in exams or maybe they do not care much about exam results. It is also possible that faculty members do not have necessary assessment skills. Some professors might put more emphasis on whether students learn (and maybe memorize as well) the information while some others might put more emphasis on the analytical skills obtained by the students. It could be argued that professors use different approaches to the exams and grading in English- medium and Turkish-medium lectures. If that is indeed the case, our results might be biased. However, as the two authors of this paper, we have both taught in English-medium and Turkish-medium courses, and asked the same type of questions in the exams and assignments in those courses. Several other professors said that their approaches

were very similar. So we are reasonably confident that professors are using similar assessment methods in English-medium and Turkish-medium courses. Since we have data from nine different departments and dozens of different professors and hundreds of different courses, naturally we wanted to use a common metric. We believe SPA is a good enough proxy for that purpose. In order to see the effect of instruction in English on the academic success of students we created a dummy variable, which takes the value 1 if the instruction is in English and 0 if in Turkish.

In addition to the English dummy we included several other factors as explanatory variables. Obviously students who are smarter and who have more effective study skills and motivation will be more successful on college courses. In order to proxy for these student specific skills and attitudes, we included the scores on college entrance exams. All college placements in Turkey are administered by a public agency Student Selection and Placement Agency. In the student placement process, the agency mostly uses the student scores on centrally administered LYS examinations. LYS examinations are similar to SATs in the US in aiming to assess student's analytical skills and knowledge on the high school curriculum. It is very competitive in Turkey and every year more than one and a half million high school graduates sit it. Since it is the main criteria in college placements, students take it very seriously and prepare for it. Although it is not perfect, many consider it a good assessment tool for the analytical skills and study attitudes of potential college entrants. Naturally we presume that the higher the score of the student on the LYS exam, the higher the SPAs in the college.

Even though LYS scores are useful and highly effective tools to control for the inherent capabilities and study habits of the students, they are not enough. High school graduation GPAs might include complementary information about students' inherent capacity and study habits. So we included high school graduation GPA as one of the independent variables. For a similar reason we included a dummy for the students who graduated at the top from their high schools and another for the students who has merit-based scholarships from the university.

It has also been shown that motivation of the student and her academic success are closely correlated. (Busato et al., 2000; Furnham & Mitchell, 1991) The student placement system is heavily criticized because, many claim, it puts emphasize on the analytical capacity of the students rather than their critical thinking abilities. Students choose the departments and universities not according to their wishes and preferences but according to their scores. Many bright students end up in medicine or engineering schools even though their characters are more suited to the art and literature majors. In the current system students choose 24 departments from different universities, starting from their most desired to the least. Students who got high scores on the

exam are placed in their most desired departments and the students who got low scores either end up in their less desirable choices or not placed at all. Thus many students are placed in departments they do not like at all. They go these schools just because they do not have anywhere else to go. Or they have high scores but their desired departments are attended by low score students. They feel pressure from their peers, parents, career counselors and future employers. In order to test the effect of initial preference on the success of the students in their actual college education we include the initial preference ranking of the department that student placed as an explanatory variable. Our hypothesis is that the higher the initial ranking of the school on the preference list, the more the student will be motivated and the more successful the student will be.

Istanbul, where the university is located, is one of the biggest cities in the world with a population of more than 15 million. Many students who came from other cities have difficulties in adjusting to big city life and also life apart from their parents. Thurber and Walton (2012) indicated that separation from home can cause homesickness, which is distressing and in turn might reduce academic success. A major part of the relevant literature focuses on the international students. For example, Rajapaksa et al. (2002) showed that international students felt lonelier and homesick than domestic students. Ramsay et al. (1999) found that international students in Australia have some difficulties in adjusting their new social and cultural environments. On the other hand, Baldwin (2015) studied the impact of smaller distances on the academic outcomes of university students. He used the distance from the home town as an independent variable in his analysis. In order to proxy for the hometown impact we created a dummy variable for the students with a permanent address in Istanbul. Note that the data we used is from a university located in Istanbul.

Finally, we included gender dummies and department dummies. Table 1 presents the variables used in the analysis and their expected signs.

Table 1
Variables Used in the Analysis

Dependent Variable:		
SPA	Semester Point Average	
Independent Variables		Expected Sign
English	Dummy variable (takes the value of 1 if the medium of instruction is in English)	-
High school GPA	High school GPA of the student	+
Percentile	Percentile ranking of the students score on LYS (university entrance exam)	-
Scholarship	Dummy variable (takes the value of 1 if the student has scholarship from the university)	+
High school top	Dummy variable (takes the value of 1 if the student graduated at the top of his high school)	+
Preference order	The order of the school at which the student is attending on her application preference	-
Istanbul	Dummy variable (takes the value of 1 if the student's permanent address is in Istanbul)	
Girl	Dummy variable (takes the value of 1 if the student is female)	?
Department dummies		?

Data Collection

We obtained all data used in the analysis from the Student Affairs Office of the university.

Data Manipulation

We have not made any data manipulation.

Model

We have estimated the following equation.

$$SPA_i = \beta_0 + \beta_1(Englsh) + \beta_2(PrcnLYS) + \beta_3(HghschlGPA) + \beta_4(HghschlTOP) + \beta_5(Schlrshp) + + \beta_6(PrfrncOrdr) + \beta_7(Grl) + \beta_8(Istnbl) + \beta_9(Dprtmn - Dummies) + \in_i$$

Results and Discussion

Table 2 presents the summary statistics of the students. The students are grouped according to the medium of instruction of their degree programs: English or Turkish. It is clear from the data that students who attend Turkish degree programs are more successful than their counterparts in English degree programs. The average SPA of students in Turkish programs is 2.15 (out of 4), while it is 2.06 in English programs. Surprisingly proxies we used in order to proxy for the inherent capacity of the students: high school GPA, percentile on LYS (the lower the percentile the more successful the student), whether the student graduated from her university at the top of her cohort, indicates whether the students are brighter and/or more hard-working. Thus based on these simple statistics it seems like the only explanation for poor performance of students in English degree programs is the instruction in a non-native language.

Table 2
Summary Statistics

	Instruction in Turkish				Instruction in English			
Variable	Mean	Standard deviation	Min	Max	Mean	Standard deviation	Min	Max
SPA	2.15	0.83	0.02	4	2.06	1.22	0	4
Percentile on LYS	28.30	12.50	0.01	75.37	23.61	15.12	0	85.15
Scholarship	0.15	0.35	0	1	0.06	0.24	0	1
High school GPA	79.96	10.89	50	100	82.70	11.95	50	100
High school top	0.003	0.06	0	1	0.014	0.12	0	1
Preference order	6.40	5.52	1	24	4.84	4.94	1	24
Istanbul	51%				49%			
Girl	33%				30%			

However, in order to test the effect of tongue on education, we estimated equation 1 using an ordinary least square technique. Table 3 presents the results of this estimate. Column 1 of Table 3 gives the results of the analysis where the only explanatory variable is the language of instruction. In the following columns the additional explanatory variables are included in the analysis.

For reading convenience the estimated parameters in column 5 (which include all explanatory variables) are copied below (except department dummies)

$$SPA_i = 1.51 - 0.123(Englsh) - 0.011(PrcnLYS) + 0.009(HghschlGPA) + 0.571(HghschlTOP) + 0.480(Schlrshp) - 0.004(PrfrncOrdr) + 0.407(Grl) + 0.232(Istnbl) + \in_i$$

It is clear from the analysis that students in English degree programs are negatively influenced by instruction in a non-native tongue. Otherwise similar students get 0.123 grade points less than their fellow students in Turkish degree programs (in the most complete analysis without department dummies, which is shown in column 5). Considering the mean SPA of the students is 2.11, that difference is very significant.

Students in both English and Turkish degree programs enjoy the same academic and other resources at the university; the same professors offer the courses in Turkish and English programs and the curriculums are identical. Tuition rates are very similar in both degree programs. Moreover, the backgrounds of the students from both degree programs are very similar. Basically the only difference in the Turkish and English programs is the instruction tongue. So the coefficient of the instruction language dummy we used in the analysis can be interpreted as negative influence of the instruction in a non-native language.

Table 3
Effects of Instruction in English to Academic Success

	1	2	3	4	5
English	−0.0893**	−0.108***	−0.107***	−0.0997***	−0.123***
	(3.22)	(3.91)	(3.84)	(3.69)	(4.21)
Percentile on LYS		−0.00378**	−0.00385**	−0.00917***	−0.0110***
		(3.00)	(3.04)	(7.21)	(5.36)
High school GPA		0.0116***	0.0117***	0.00715***	0.00979***
		(9.88)	(9.78)	(5.76)	(7.88)
High school top		0.558**	0.559**	0.611***	0.571**
		(2.88)	(2.89)	(3.33)	(3.19)
Scholarship		0.438***	0.437***	0.440***	0.480***
		(8.20)	(8.18)	(8.08)	(6.95)
Preference order			0.0011	0.0015	−0.0044
			(0.47)	(0.66)	(1.90)
Girl				0.391***	0.407***
				(13.56)	(14.23)
Istanbul				0.226***	0.232***
				(8.79)	(9.29)
Physics					−0.268***
					(4.85)
Chemistry					−0.233***
					(4.38)
Electronic Engineering					−0.108*
					(2.23)
Computer Engineering					0.04
					(0.90)
Environmental Engineering					0.462***
					(5.10)
Management					0.356***
					(8.79)
Economics					0.226***
					(5.32)
Constant	2.150***	1.267***	1.255***	1.517***	1.320***
	−123.36	−11.53	−11.01	−12.93	−10.42
N	4151.00	4151.00	4151.00	4151.00	4151.00
Adjusted R-sq	0.00	0.09	0.09	0.14	0.20

This table reports results from the estimation of equation 3 by ordinary least squares using a heteroskedastic structure. The dependent variable is SPA of each student. The t statistics are reported in parentheses. ***, ** and * denotes significance levels at 1%, 5% and 10%, respectively.

The rest of the independent variables affect the SPA of the students in the expected ways. Students who achieved higher scores in exams before coming to university had higher SPAs during university education as well. Namely, students who obtained higher scores (at the lower percentile) on LYS examinations, had higher high school graduation GPAs, graduated at the top of their high schools and had merit-based scholarships from the university had higher academic success in the university. This is in line with the previous studies analyzing the impact of intelligence and personal traits on academic success: high school GPA and university exam scores were found to be positively correlated with the GPA or SPA of university students (Allik & Realo, 1997; Premuzic & Furnham, 2003; Stinebrickner & Stinebrickner, 2008).

Like everything else in life, academic success in university depends on the motivation level of individuals. If the students are more motivated (ceteris paribus) they are more successful. In order to proxy the motivation level of the students we used an indirect variable. There is a centrally managed college placement system in Turkey. After taking the LYS exam, students choose up to 24 different departments and universities. They submit these preferences to the Student Selection and Placement Agency who, using students' LYS scores and high school graduation GPAs and a certain methodology, creates a score for each student. Later students are ranked on this new index according to their scores. The student who is at the top of the list is placed at their most desired school. Then the second best student is placed at their most desired university. Naturally many prestigious departments and schools are desired by too many applicants. Thus only students who are at the top can be placed at those prestigious schools. The placements continue until all departments are filled with the applicants. The nature of the process creates some uncertainties. So applicants generally put their more desired schools (which are generally more desired by many others thus more prestigious) on the top of their preference lists and put less desired schools (which are generally less desired by many others thus less prestigious) on the lower parts of their lists. So our hypothesis is that students who are placed at their more desired schools like university and their major more than others and thus become more successful. The higher the preference order of the school, presumably the lower the enthusiasm of the student for the department she is placed, and thus the lower the success. The negative and statistically significant coefficient implies that is indeed the case. Student who is placed at her first choice department gets 0.044 points higher than a student who is placed at their 10th choice. We interpret this result, as suggested in the previous papers (Busato et al., 2000; Furnham & Mitchell 1991), as more motivated students are more successful in college life.

A positive and statistically significant gender dummy tells us that girls are ceteris paribus more successful, as are students whose permanent address is in Istanbul (population 14+ million), as they presumably have less difficulty in adjusting to

big city life and are thus more successful. This result is parallel to the observation of Rajapaksa et al. (2002) suggesting that international students have difficulties in adjusting to their new environment and thus their performance is negatively influenced. On the other hand, Baldwin (2015) found that students whose homes are more distant are not negatively affected in terms of retention.

Finally, department dummies are significant as well. The omitted department is mathematics. According to the analysis the most successful students are in environmental engineering and the least successful are in physics. Obviously the difficulty level, expectations from the students and other discipline-specific cultural things are very different in different departments. So we should not put too much importance on these coefficients of these dummies.

Normal Students vs. Scholarship Students

It is possible that the language of the instruction influences some students differently than others. It is possible that merit-based scholarship students might be different to regular students in other ways. Merit-based scholarships are where the university completely waives tuition fees and in some cases provides extra stipends. The majority of scholarship opportunities are filled according to the students' LYS scores. So these scholarships provide opportunities for the bright and motivated but relatively poor students to attend relatively expensive foundation universities. However, many universities cut the scholarship of the students in the case of academic failure. So we expect students with scholarship to study harder than their fellow students because the cost of failure is higher for them. For many of these students the tuition is prohibitively expensive. The university we have collected the data from does not cut students' scholarships in the case of academic failure. However, if the student does not graduate in 4 years, they have to pay for the tuition until graduation. So scholarships dummy not only a proxy for the previous capacity of the student but also picks up for some motivation. Moreover, students with and without scholarships can have different socioeconomic backgrounds. Generally regular students are relatively wealthy. They might also have different career prospects after graduation. Thus it is possible that the language of instruction has a different influence on the academic success of regular and scholarship students.

In order to see whether that is indeed the case, we ran separate regressions for students with and without scholarships. Table 4 presents the estimation results for regular and scholarship students separately.

Table 4
Effects of Instruction in English on Success of Normal and Scholarship Students

	1	2	3
	Whole sample	Regular Students	Scholarship Students
English	−0.123***	−0.226***	0.800***
	(4.21)	(7.45)	(7.83)
Percentile on LYS	−0.0110***	−0.0130***	−0.0717***
	(5.36)	(5.88)	(7.33)
High school GPA	0.00979***	0.00729***	0.00401
	(7.88)	(5.51)	(1.000)
High school top	0.571**	1.147***	−0.275
	(3.19)	(9.73)	(1.47)
Scholarship	0.480***	.	.
	(6.95)	.	.
Preference order	−0.00444	−0.00514*	0.0323**
	(1.90)	(2.14)	(2.65)
Girl	0.407***	0.435***	0.654***
	(14.23)	(14.63)	(6.72)
Istanbul	0.232***	0.249***	0.346***
	(9.29)	(9.64)	(3.55)
Physics	−0.268***	−0.123*	−0.371*
	(4.85)	(2.12)	(2.11)
Chemistry	−0.233***	−0.130*	−0.23
	(−4.38)	(2.32)	(1.14)
Electronic Engineering	−0.108*	−0.124*	−0.255
	(2.23)	(2.51)	(1.55)
Computer Engineering	0.0447	0.0573	−0.723***
	(0.9)	(1.13)	(3.33)
Environmental Engineering	0.462***	0.560***	−0.0644
	(5.1)	(5.51)	(0.28)
Management	0.356***	0.333***	−0.0576
	(8.79)	(7.92)	(0.39)
Economics	0.226***	0.241***	−0.0742
	(5.32)	(5.52)	(0.43)
Constant	1.320***	1.588***	2.525***
	(10.42)	(11.6)	(6.32)
N	4151	3704	447
adj. R-sq	0.201	0.163	0.436

Note. This table reports results from estimation of equation 3 by ordinary least squares using a heteroskedastic structure. The dependent variable is the SPA of each student. Column 1 uses the whole sample, column 2 uses the data for regular students, and column 3 uses the data for scholarship students. The t statistics are reported in parentheses. ***, **, and * denotes significance levels at the 1%, 5%, and 10% levels, respectively.

Table 4 presents these results. For reading convenience the estimated coefficients are copied below (except department dummy estimates).

For regular students:

$$SPA_i = 1.588 - 0.023(Englsh) - 0.072(PrcnLYS) + 0.007(HghschlGPA) + 1.147(HghschlTOP) - 0.005(PrfrncOrdr) + 0.435(Grl) + 0.249(Istnbl) + \in_i$$

For merit-based scholarship students:

$$SPA_i = 2.525 + 0.800(Englsh) - 0.009(PrcnLYS) + 0.004(HghschlGPA) - 0.275(HghschlTOP) + 0.003(PrfrncOrdr) + 0.654(Grl) + 0.346(Istnbl) + \in_i$$

The results for the regular students are very similar to the previous results. Indeed, the negative influence of instruction in English is more pronounced (both the value of the coefficient and statistical significance are higher) However results for the scholarship students are strikingly different. In fact, instruction in English positively impacts the success of the students. It is not obvious why instruction in English has different effects on students with and without scholarships. However, several explanations can be put forward. First normal students might not be as bright/ motivated as scholarship students. So during English preparatory training, they did not learn English as well as the scholarship students. Thus a relatively low level of English fluency prevents them from succeeding in their academic courses.

One advantage of instruction in English is higher quality of support materials compared to the materials in Turkish. Textbooks, articles, support websites, practice questions are better in both quality and quantity in English than in Turkish. As students with scholarships are usually more motivated they take advantage of those support materials. However, in Turkish degree programs the support materials in Turkish are not as good as the support materials in English. Thus those students who are in English degree programs are more successful. As far as we know, ours is the only study that attempts to parse out the differential impact of language of instruction on bright and normal students.

Are the Negative Effect Temporary?

One might hypothesize that students in their freshman year are not familiar with the academic English and they get better in time. The negative effect of instruction in English can fade away for the sophomores, junior, and senior students; thus we estimated our main regression for freshman, sophomore, junior, and senior students separately. Table 5 reports those results.

Table 5a
Effects of Instruction in English on Regular Students at Various Levels

	Whole sample	1st year	2nd year	3rd year	4th year
English	−0.226***	−0.403***	−0.0401	−0.212***	−0.218***
	(7.45)	(6.98)	(0.68)	(3.37)	(3.84)
Percentile on LYS	−0.0130***	−0.0228***	−0.00989*	−0.0127*	−0.00799
	(5.88)	(5.59)	(2.34)	(2.54)	(1.92)
High school GPA	0.00729***	0.00754**	0.00557*	0.00848**	0.00738**
	(5.51)	(2.98)	(2.17)	(3.21)	(2.91)
High school top	1.147***	1.245***	1.253***	1.073***	1.063***
	(9.73)	(5.47)	(5.16)	(7.1)	(9.43)
Preference order	−0.00514*	−0.00769	−0.00557	−0.00536	−0.00216
	(2.14)	(1.73)	(1.17)	(1.13)	(0.47)
Girl	0.435***	0.386***	0.510***	0.405***	0.465***
	(14.63)	(6.73)	(8.9)	(6.74)	(8.49)
Istanbul	0.249***	0.302***	0.271***	0.225***	0.194***
	(9.64)	(5.9)	(5.28)	(4.39)	(4.09)
Physics	−0.123*	−0.00382	−0.262*	−0.124	−0.0871
	(2.12)	(0.04)	(2.56)	(0.98)	(0.77)
Chemistry	−0.130*	−0.0348	−0.203	−0.0611	−0.211
	(2.32)	(0.34)	(1.82)	(0.56)	(1.88)
Electronic Engineering	−0.124*	0.117	−0.116	−0.181	−0.333***
	(2.51)	(1.13)	(1.18)	(1.87)	(3.73)
Computer Engineering	0.0573	0.00459	0.0545	−0.08	0.217*
	(1.13)	(0.04)	(0.55)	(0.80)	(2.49)
Environmental Engineering	0.560***	0.636**	0.657***	0.485*	0.531**
	(5.51)	(3.19)	(3.6)	(2.05)	(2.93)
Management	0.333***	0.347***	0.365***	0.334***	0.328***
	(7.92)	(4.27)	(4.19)	(4.01)	(4.14)
Economics	0.241***	0.369***	0.270**	0.204*	0.145
	(5.52)	(4.36)	(2.95)	(2.33)	(1.84)
Constant	1.588***	1.806***	1.346***	1.459***	1.741***
	(11.6)	(6.99)	(5.2)	(5.23)	(6.57)
N	3704	950	901	864	989
adj. R-sq	0.163	0.188	0.19	0.152	0.2

Note. This table reports results from the estimation of equation 3 by ordinary least squares using a heteroskedastic structure. The dependent variable is the SPA of each student. Column 1 uses the whole sample of regular students, column 2 uses the data for first year regular students, and column 3 uses the data for second year regular students. The t statistics are reported in parentheses. ***, **, and * denote significance levels at 1%, 5%, and 10%, respectively.

Table 5b
Effects of Instruction in English on Scholarship Students at Various Levels

	Whole sample	1st year	2nd year	3rd year	4th year
English	0.800***	0.440*	0.788***	1.128***	0.888***
	(7.83)	(2.3)	(3.5)	(4.98)	(5.35)
Percentile on LYS	−0.0717***	−0.0645***	−0.0864***	−0.0740**	−0.0811***
	(7.33)	(4.04)	(4.14)	(3.38)	(3.97)
High school GPA	0.00401	0.0128*	0.00538	−0.00263	0.000957
	(1.00)	(2.09)	(0.75)	(0.24)	(0.13)
High school top	−0.275	−0.239	−0.198	−0.375	−0.526
	(1.47)	(0.56)	(0.55)	(1.08)	(1.40)
Preference order	0.0323**	0.000748	0.0495*	0.0567	0.0355
	(2.65)	(0.04)	(2.08)	(1.92)	(1.43)
Girl	0.654***	0.623***	0.662**	0.777***	0.655***
	(6.72)	(3.63)	(3.15)	(3.97)	(3.7)
Istanbul	0.346***	0.499**	0.177	0.344	0.381
	(3.55)	(2.99)	(0.93)	(1.76)	(1.86)
Physics	−0.371*	−0.585	−0.466	−0.242	−0.0311
	(−2.11)	(1.97)	(1.30)	(0.67)	(0.10)
Chemistry	−0.23	−0.264	−0.158	−0.406	0.0329
	(1.14)	(0.79)	(0.40)	(0.97)	(0.09)
Electronic Engineering	−0.255	−0.092	−0.297	−0.39	−0.242
	(1.55)	(0.35)	(0.93)	(1.10)	(0.91)
Computer Engineering	−0.723***	−0.596	−1.134	−0.5	−0.783*
	(3.33)	(1.20)	(1.98)	(1.61)	(2.48)
Environmental Engineering	−0.0644	−0.273	0.0734	−0.289	0.493
	(0.28)	(0.74)	(0.15)	(0.57)	(1.12)
Management	−0.0576	−0.116	−0.122	0.128	−0.141
	(0.39)	(0.55)	(0.37)	(0.36)	(0.50)
Economics	−0.0742	−0.135	−0.181	0.103	0.033
	(0.43)	(0.51)	(0.58)	(0.23)	(0.1)
Constant	2.525***	2.097**	2.348**	2.707*	2.865***
	(6.32)	(3.29)	(3.35)	(2.52)	(4.1)
N	447	122	110	102	113
adj. R-sq	0.436	0.451	0.486	0.407	0.435

Note. This table reports results from estimation of equation 3 by ordinary least squares using heteroskedastic structure. Dependent variable is SPA of each student. Column 1 uses the whole sample of scholarship students. Column 2 uses the data for first year scholarship students, and column 3 uses the data for second year scholarship students. The t statistics are reported in parentheses. ***, **, and * denotes significance levels at the 1%, 5% and 10% levels, respectively.

Since the previous analysis suggests that students with and without scholarships have different dynamics, we estimated those regressions separately. The results indicate that it is true that the magnitude of negative influence of instruction in a non-native language is the highest in the first year. However, it is still there in following years. Interestingly the magnitude of positive effect of the English instruction is

higher for scholarship students in their sophomore, junior, and senior years. So we can conclude that students get better at understanding lectures in English and utilize support materials in English more effectively.

It is also interesting that the effect of previous success of the student (score on LYS, whether the student graduated at the top of her high school) is smaller for higher level students. Similarly, the negative effect of being placed in a relatively less desired department (being placed in a school toward the end of the preference list) is smaller in junior and senior years. Adjustment effects to living in Istanbul also decrease over time, which we can interpret as the students adjusting to their circumstances. Effects of previous skill and knowledge level, previous disposition toward a particular department and previous residence location slowly dissipates.

Conclusions

It has been argued that instruction in a non-native language creates many obstacles to student success. Students who are not fluent in the medium of instruction language that is not their native tongue have difficulty in grasping course topics. Conversely, generally course materials developed in English are superior to the course materials in the native language of students both in quality and quantity. Which one of those influences outweighs the other one is not certain a priori. So the analysis of the effect of medium of instruction in a non-native language is essentially an empirical one.

In order to test these effects, we utilized the data from a semi-natural experiment. A foundation university in Istanbul was chosen, with many departments that offer BA and BS programs in both native language of the students (i.e., Turkish), and in English; the curriculum, professors, library, physical facilities etc. were assumed to be the same for both degree programs. Socioeconomic and academic backgrounds of the programs are also very similar. Thus the only difference between those programs is the medium of instruction language. We have studied the influence of medium of instruction language on the academic success by using student level SPA data. In our analysis, other than the language variable we included proxies for the inherent skills and study attitudes of students (score on LYS exam, high school graduation GPA), preference order of the department for the student, gender, and department dummies.

Our results suggest that instruction in English significantly and negatively affects the academic success of the majority of students. This is in line with the previous studies in the literature which have shown different negative aspects of instruction in students' non-native languages. This effect is highest in the freshman year but it reduces over time, although never disappears. However, the opposite impact is observed for the students who have merit-based scholarships from the university. Those students

are different from their peers both academically and socioeconomically. They are usually brighter and more motivated but are relatively less wealthy. We believe that the scholarship students work harder on English and become more fluent and thus feel no negative influence of instruction in English. Moreover, as they are more motivated and more fluent in English they utilize support materials in English, which gives them an edge over their peers in Turkish degree programs.

Moreover, we find that inherent skill level and good study attitudes (which are proxied by LYS score, high school graduation GPA, and etc.) help students to succeed at university. However, the positive effects of those are also smaller in higher level courses.

However, we have to clarify what we are not doing in this study. Our study does not imply that English-medium instruction is harmful to the students. We simply try to assess the "costs" of instruction in English. We are not in any way measuring the benefits of instruction in English. As has shown in the relevant literature, university education in English might improve students' English skills. Improved English might have a tremendous direct and indirect effect on the professional and personal lives of these students. Students with improved English might be much more successful and happier in their later lives. Moreover, if English-medium instruction indeed improves the quality of the education and research and thus the status of the university, that would create extra advantages for the students both during their education and after their graduation. One direct impact of English-medium instruction is the attraction of international students and faculty members. It is well known that the more globalized universities prepare their students better for after graduation live. So any policy decision has to take into account both costs and benefits, which we do not measure in this study of instruction in English.

The second caveat that we want to emphasize is the heterogeneous effects of medium of instruction on different students. We have shown that academic success of regular students at foundation universities are negatively affected by instruction in English. On the other hand, scholarship students are positively affected from instruction in English. The easiest way to explain this differential impact is to presume that regular students do not learn English well during their preparatory period. We might suggest that the scholarship students are brighter and/or more motivated so they learn English better than regular students. In other words, if students know English well, their academic success is positively affected from instruction in English. This might provide a clue about the impact of instruction in English in "elite" universities. In those universities instruction in English would improve the academic success of the students along with other benefits of improved English levels. So we do not claim that abandoning instruction in English is a good strategy for the "elite" universities

or those that can teach English well. However, we can safely suggest that making students learn English better than the current situation might improve the students' wellbeing both during their education and after their graduation.

Finally, we are not in any way claiming that the students who choose the universities where the medium of instruction is English are acting irrationally. If the universities with English-medium instruction are considered more "elite" by the potential employers and general society, it might be a good strategy to attend there regardless of the other "costs" identified on this paper.

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