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The impact of access to ICT, student background and school/home environment on academic success of students in Turkey: An international comparative analysis

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ABSTRACT

This paper utilizes OECD's original PISA 2012 dataset to investigate the impact of access to ICT, student background and school/home environment on academic performance of students. Using cross-section data from 4848 15-year-old students in Turkey, ordered logit models are developed and analyzed. The results indicate that (i) availability of internet connection at home or school and student's possession of his/her own room at home have positive impacts on academic success, (ii) internet connection at schools may not be used for school-related activities and therefore distracts student's attention from schoolwork, (iii) as student-per-teacher ratio or school size increases, the academic success of students declines, (iv) pre-primary education and education in student's native language contribute to academic achievement, (v) there is a positive relationship between education level of parents and student's performance at school. Using additional data from 22,273 students, the paper also presents an international analysis that compares the results from Turkey with those from Germany, France and the United Kingdom. Finally, the urgent need for collection of micro level (at student, school or parent level) data on Turkish education system is underlined.

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1. Introduction

The results of the Programme for International Student Assessment (PISA), conducted in 2012 by the Organisation for Economic Co-operation and Development (OECD), led to a public outcry in Turkey as the students in Turkey got the third-lowest test scores[3] among OECD countries in all three test subjects, namely mathematics, science and reading. So, an intense public debate on the quality of education system in Turkey has begun. PISA made headlines on the front pages of all leading Turkish newspapers for several weeks. For example, on December 3, 2013, Hurriyet (2013) titled "Turkey Failed Again in OECD's PISA 2012 Report". Consequently, "PISA" is now a catch-phrase, known by many citizens in Turkey, for the poor state of the Turkish education system. While this coverage proves the immense public interest, the quality of much of the underlying analysis is less clear. Often, public assessments tend to simply repeat long-held believes, rather than being based on data produced by the PISA 2012 study.

Today, it is commonsense that better school performance provides students greater opportunities to succeed in their subsequent life. Individuals who succeed in school have strong advantages in occupational placement and earnings attainment (Ganzeboom, Treiman, & Ultee, 1991; Kerckhoff, 1995). In this context, there is considerable debate regarding *how academic performance at school can be*

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enhanced. Do student background, school and home environment produce improvements in student performance? Are not access to information and communication technologies (ICT) critical to promoting student success?

The theory and the previous literature covered in Section 2 suggest that student background, school and home environment and access to ICT are among important sets of determinants of educational performance. In the paper, PISA 2012 dataset is used to test the robustness of the findings of previous studies in Turkish context by constructing and estimating an education production function for Turkey. The paper focuses on the relationship between academic success **and** student background, school/home environment and access to ICT. It also compares the results from Turkey with those from Germany, France and the United Kingdom in order not only to put the results from Turkey into an international context but also to attract more interest from the international research community.

The contribution of this paper to the current literature is threefold. As in the case of most countries, the primary objective of education policy in the Republic of Turkey is to increase the amount of student learning that results from the 13.5% of central government budget (63.5 billion TL) allocated to education (GDBFC, 2013). However, at the moment, reliable information and research about to what extent this spending is translated into improved student learning is extremely limited and, therefore, the benefits obtained from this enormous outlay of public resources remain elusive. Therefore, first of all, this paper attempts to shed a light on this question. So, it is an important contribution to the remarkably narrow literature that focuses on the factors related to academic performance of students in Turkey. Second, this is among the very first studies that exploit OECD's fresh PISA 2012 dataset. Finally, this paper is one of the few studies to use ordered logit regression methods to estimate the impacts of student background, school and home environment and access to ICT on student performance.

The paper tries to answer the following research questions: (i) what is the relationship between student background and academic success in Turkey? (ii) how do school characteristics affect the educational success of students in Turkey? (iii) what are the effects of home/family environment on student achievement in Turkey? (iv) is students' internet use at home and school in Turkey related to their performance at school?

The remainder of the paper is structured as follows. The second section presents a literature review of empirical studies investigating the factors related to academic performance of students, and develops the hypotheses to be tested in the study in order to answer research questions above. In the third section, methodology and data are explained. The following section presents empirical analysis. Section 5 discusses the results and their policy implications. The next section provides an international analysis that compares the results from Turkey with those from Germany, France and United Kingdom. The final section concludes.

2. Literature review and research hypotheses

The objective of educational institutions is to increase the level of academic success which itself is an indicator of the actualization of educational goals. A vast literature has focused on examining the linkages between educational inputs (i.e., per pupil expenditures, pupil-teacher ratio and so on) and educational outputs (e.g. student achievement or future labor market wages). These individual studies often differ in their findings, depending on the assumptions of the model and the choice of inputs. A summary of previous econometric studies is systematically presented in Appendix 1, clearly indicating hypotheses tested or research questions, dependent variables, explanatory variables, main results, data and methodology. The studies presenting an anecdotal discussion without any applied analysis are outside the scope of the literature review in this section.

As done in this study, the factors considered in the literature as having an impact on the academic performance of students may be divided into four, namely student characteristics, home/family background, school resources and access to ICT. Ammermueller (2007), Bahar (2010), Castillo-Merino and Serradell-López (2014), Darolia (2014), Erten and Burden (2014), Freitas and Leonard (2011), Goulart and Bedi (2008), Mostafa (2010), Perl (1973) and Rangvid (2007) focus on the impact of student characteristics on academic performance while the effect of home/family background on school success is investigated by Carneiro (2008), Chiu (2010), Chiu and Khoo (2005), Cyrenne and Chan (2012), Gevrek and Gevrek (2010), Houtenville and Conway (2008), Lindahl (2011), Marks (2008), Mertoğlu and Aydın (2012), Mostafa (2010), Pong (1997), Rangvid (2007) and Toby and Dufur (2001).

The impact of school resources on student achievement constitutes another topic extensively studied in the literature. The examples include Ammermueller (2007), Calcagno, Bailey, Jenkins, Kienzl, and Leinbach (2008), Chiu (2010), Chiu and Khoo (2005), Collier and Millimet (2009), Cyrenne and Chan (2012), Erten and Burden (2014), Fuchs and Wößmann (2007), Graddy and Stevens (2005), Hanushek (1997), Ludwig and Bassi (1999), Mostafa (2010), Perl (1973), Pong (1997), Rangvid (2007) and Toby and Dufur (2001). However, these studies by no means constitute an exhaustive list of the literature. Hanushek (1997) reviews about 400 studies of student achievement and concludes that there is not a strong or consistent relationship between student performance and school resources, at least after variations in family inputs are taken into account. His results underline that simple resource policies alone hold little hope for improving student outcomes. The impact of access to ICT on education output is probably the least explored aspect of student performance. The paper by Wittwer and Senkbeil (2008) is a prominent study in this area.

The literature above implies that academic success of students, measured usually by grade point average (GPA) or various test scores, is correlated with individual characteristics and their backgrounds (Betts & Morell, 1999; Irandoust & Karlsson, 2002). In this paper, the validity of this finding in Turkish context is tested within the framework of PISA 2012 dataset. So, the following hypothesis is derived as a direct parallel with the empirical findings reported in the literature.

Hypothesis 1: *Students' academic performance at school is affected by their personal characteristics and background.*

Since the landmark 1966 Coleman Report in USA, which found evidence that poor black children did perform better in integrated middle-class schools, researchers from a number of disciplines have sought empirical evidence of which school inputs influence student achievement. This literature initiated a debate around whether financial resources influence student achievement. In an influential series of papers, Hanushek (1986, 1989, 1996a, 1996b, 1997, 1998) reviewed the many studies of the impact of school resources (particularly class size or pupil-teacher ratio) on student achievement in U.S. schools and concluded that there is no strong or consistent relationship between school inputs and student performance. However, Hedges and Greenwald (1996) and Krueger (1999) find positive correlation between