ARE WE DIGITALLY ILLUDED? RESULTS FROM PISA 2009

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Keywords Computer usage - Educational achievement PISA

JEL classification I21 - I28 – J24

1 Introduction

Changing needs of economic and social development have urged governments to emphasize the contribution of education to a wide range of newly required skills and competencies. The recommendations of the European Parliament and the Council on key competences for lifelong learning identify a framework of eight competences necessary in a knowledge society (European Commission, 2006). Digital competences, defined as the confident and critical use of Information and Communication Technologies (ICT) for work, leisure and communication, are highlighted as one of these eight key competences. The central role of new technologies and digital competences for active citizenship, social cohesion, employability and economic development is further reaffirmed in the recently adopted initiatives "New Skills and Jobs" (European Commission, 2010a) and "Digital Agenda for Europe" (European Commission, 2010b). Education has a unique role to play in providing young people with the skills needed in a society in which ICT related skills and competences are increasingly indispensable.

[1] The analysis was conducted when Massimo Loi was at the European Commission – Joint Research Centre (EC - JRC) - Institute for the protection and Security of the Citizen (IPSC),Unit G.03 Econometric and Applied Statistics (EAS)

It is, therefore, relevant to assess and compare how education systems are dealing with the integration of technology in education, particularly in terms of securing and improving access, enhancing a wide range of educational and managerial uses, and monitoring the effects and impacts on the development of critical technology-related skills and competencies.

Based on these considerations, the current study focuses on the relationship between students' computer use and their achievement in reading and mathematics controlling for students and school characteristics, with a particular attention on the ways students use ICT (see Witter and Senkbeil, 2008). The following questions are addressed:

1. Does the way in which students use a computer affect their school performance?
2. Is this effect dependent upon students' social and economic background?

Measuring the impact of information technology on students' learning is not an easy task. Experimental and quasi-experimental studies aim at comparing the performance of students using ICT (at home, at school or both) – the experimental group – with the performance of students not using these technologies – the control group –. In these studies "learning" is often reduced to student performance on a test, so that their conclusions are valid only for those aspects of the learning process that are measured by that specific test. Moreover, while experimental studies are difficult to realize because of ethical issues, quasi-experimental studies deal with the difficulty – at least for the occidental countries – of defining a control group and an experimental group that are mutually exclusive (i.e. it is difficult to identify groups of students "with" and "without" ICT). Other challenges concern the nature of the data that is available.

The primary source of data for our analysis is the fourth wave of the Programme for International Student Assessment (PISA) 2009 survey, which allows us to test whether the intensity of utilization of ICTs, both at school and at home, are associated with positive results in PISA scores, which measures reading, mathematical and scientific skills.

Computer use is introduced into our analysis considering different dimensions: the intensity of use, the overall number of activities performed and the types of activities performed, as well as the place where the computer is used (at home, at school or both). Our analysis is focused on the European countries that completed the PISA 2009 optional questionnaire on students' familiarity with ICT plus Iceland, Norway and Turkey. The Netherlands is not included in the study because of missing data issues while Austria has been excluded from the analysis because of data reliability issues.

Our paper contributes to the literature on the impact of ICT on educational outcomes in various respects. First we look at the relationship between PISA test grades and ICT utilization. Exploiting the ICT questionnaire contained in PISA 2009 we are able to gather detailed information on the typology and intensity of ICT use by 15 years old students. This possibility was not present with PISA 2006 (see Spiezia 2010) and it is very important for our purpose because it allows us to characterize different types of profiles (we expect the effects of using intensively PCs and software during classes on the PISA test scores to be different from the effects of spending afternoons and evenings playing videogames). Second, we test whether the utilization of ICT (at school and, especially, at home) tends to reinforce differences originating from the social environment in which students are brought up. In other words, we want to understand whether ICTs utilization tend to complement other learning skills that are transmitted by the social environment or whether it can reduce the impact of such idiosyncratic factors.

Our results show that it is difficult to detect a clear positive relationship between the use of new technologies and students' performance as measured by the PISA test. Moreover we do not find strong evidence supporting the hypothesis that the use of ICT reinforces pre-existing social and economic differences.

These results, which -prima facie- could be read as evidence that investment in ICT has been ill-placed, should in fact be interpreted with great care. On the one hand we have the issue of the type of skills that the PISA test is measuring. To the extent that such test tends to focus on abilities typically related with traditional teaching techniques, one should not expect to see any positive effect of intensive ICT utilization. Moreover, the PISA dataset does not allow us to have granular information on the type of utilization of ICT at the school level. In particular, we do not know whether ICT are just added into a

traditional curriculum or whether they actually shape –at least partially- the curriculum. This is important since we do not expect any particular benefit coming from the utilization of ICT into a fully traditional CV.

2 Data and conceptual framework

The primary source of data for our analysis is the fourth wave of the Programme for International Student Assessment (PISA) administered in 2009. The PISA is a cross national survey that, each three years since 2000, assesses 15-year old students' performance in mathematics, reading and science, as well as cross-curricular problem-solving skills. PISA considers students' knowledge in these areas not in isolation, but in relation to their ability to reflect on their knowledge and experience and apply them to real-world issues. The emphasis is on mastering processes, understanding concepts and functioning in various contexts within each assessment area. The three domains assessed in PISA 2009 can be synthesized as follow:

> "*Reading literacy is understanding, using, and reflecting on written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society*";
>
> "*Mathematical literacy is an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen*";
>
> "*Scientific literacy is the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity*" (OECD, 2011b).

In each PISA cycle only one domain is tested in detail, taking up nearly two-thirds of the total testing time (about 390 minutes). The major domain in 2000 was reading, in 2003 it was mathematics and in 2006 it was science. In 2009, it is reading

again, building on a modified reading framework which incorporates the reading of electronic texts and elaborates the constructs of reading engagement and meta-cognition (OECD, 2011a).

In addition to evaluating student performance, PISA collects contextual data on the characteristics of the students, of their family and of the school they attend. Furthermore, PISA gives the country the option to administer a 10-minutes questionnaire on students' familiarity with Information and Communication Technologies (the PISA-ICT 2009). Through this questionnaire, students are asked which kind of new technologies are at their disposal at home and at school, if they use them, how often and for what purposes. Students are also asked to self-assess their level of proficiency in performing certain tasks using a computer and to express their attitude toward computers.

The PISA survey used a two-stage stratified sampling procedure to collect the data. First, schools having 15-years-old students were selected systematically with probabilities proportional to their size. Second, eligible students within the sampled schools were selected with equal probability (OECD, 2009). Given this complex sampling design, the student-sample is characterized by a hierarchical structure in which students are nested within classes and schools which, in turn, are nested in countries or geographic regions.

The analyses contained in this work consider only the European countries that completed the optional questionnaire on students' familiarity with ICT (plus Iceland, Norway and Turkey) and only the student-level observations with no missing values on any variable of interest (listwise deletion). The full sample is composed by 23 countries and mostly by students with some experience in using ICT[2]. France, Luxembourg, the United Kingdom and Romania are not in the dataset because they did not complete the PISA-ICT questionnaire, while the Netherlands has been excluded from the econometric estimates because of missing data issues[3]. Similarly, Austria was not considered in the more empirical part of the study because of data reliability issues. Table 1 presents the structure of the sample retained for the econometric analyses.

[2] About 97% of the students in the selected dataset declared to have used a computer before the survey.
[3] The Netherlands, although completed the ICT familiarity questionnaire, is completely missing for the information concerning the use of ICT at home for entertainment purposes (variables from IC04Q01 to IC04Q09 of the OECD-PISA dataset).

Table 1. Dataset structure: students and schools distribution by country

	Students		Schools	
	abs.	%	abs.	%
BE	8,501	5.16	278	4.4
BG	4,507	2.74	178	2.8
CZ	6,064	3.68	261	4.2
DE	4,979	3.02	226	3.6
DK	5,924	3.60	285	4.6
ES	25,887	15.72	889	14.2
EE	4,727	2.87	175	2.8
FI	5,81	3.53	203	3.2
EL	4,969	3.02	184	2.9
HR	4,994	3.03	158	2.5
HU	4,605	2.80	187	3.0
IE	3,937	2.39	144	2.3
IS	3,646	2.21	131	2.1
IT	30,905	18.77	1097	17.5
LT	4,528	2.75	196	3.1
LV	4,502	2.73	184	2.9
NO	4,66	2.83	197	3.1
PL	4,917	2.99	185	3.0
PT	6,298	3.83	214	3.4
SK	4,555	2.77	189	3.0
SI	6,155	3.74	341	5.4
SE	4,567	2.77	189	3.0
TR	4,996	3.03	170	2.7
Pooled sample	164,633		6,271	

Note: unweighted data

Source: OECD - PISA 2009

The analyses have been realized using normalized weights calculated following the procedure suggested by the PISA 2009 data analysis manual (OECD, 2009, p. 219).

The 2009 PISA questionnaire has an optional part on the use of ICT by students, both at home and at school (it is called ICT familiarity component). We start with Q1 and Q2 of this part, where questions on the availability of ICT at home and school are asked.

Q1 **Is any of these devices available for you to use <u>at home</u>?**

(Please tick one box on each row)

	Yes, and I use it	*Yes, but I don't use it*	*No*
a) Desktop computer	☐ 1	☐ 2	☐ 3
b) Portable laptop or notebook	☐ 1	☐ 2	☐ 3
c) Internet connection	☐ 1	☐ 2	☐ 3
d) <Video games console>, e.g. <Sony PlayStation™>	☐ 1	☐ 2	☐ 3
e) Cell phone	☐ 1	☐ 2	☐ 3
f) Mp3/Mp4 player, iPod or similar	☐ 1	☐ 2	☐ 3
g) Printer	☐ 1	☐ 2	☐ 3
h) USB (memory) stick	☐ 1	☐ 2	☐ 3

Q2 **Is any of these devices available for you to use <u>at school</u>?**

(Please tick one box in each row)

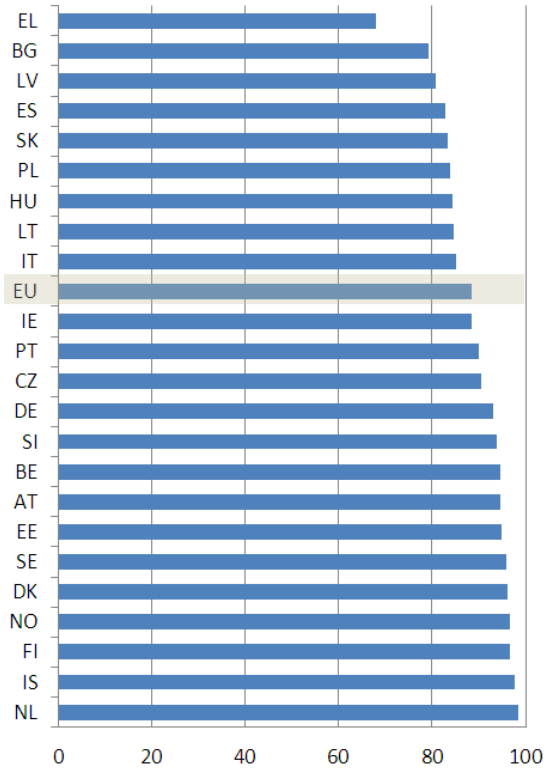
	Yes, and I use it	*Yes, but I don't use it*	*No*
a) Desktop computer	☐ 1	☐ 2	☐ 3
b) Portable laptop or notebook	☐ 1	☐ 2	☐ 3
c) Internet connection	☐ 1	☐ 2	☐ 3
d) Printer	☐ 1	☐ 2	☐ 3
e) USB (memory) stick	☐ 1	☐ 2	☐ 3

The data tell us that there exist large across-country differences in ICT availability (and use). On average, 88.3% of the students in Europe have and use internet at home; this percentage is above 95% in all the Nordic countries (it is maximum in the Netherlands with 98.6%) and it is below 80% only in Bulgaria (79.1%) and Greece (68.1%) (Figure 1a). In all the countries but Poland, the share of students using the

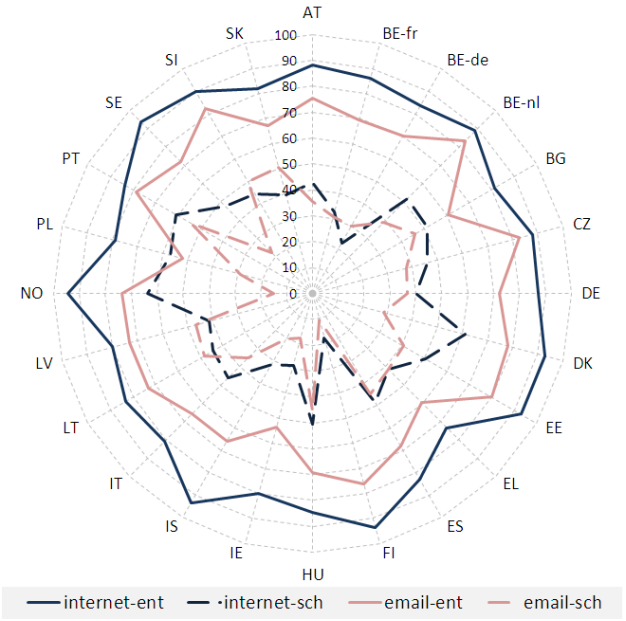
internet or the e-mail at least once a week for entertainment is well above the share of students using these media for school related purposes. Only in Portugal and Slovakia students report using e-mail for schoolwork in more than half of the cases (54.2% and 50.3%, respectively); in 9 countries[4] the majority of students report browsing the internet for school work, while in 7 countries[5] nine tenth of students report browsing for fun (Figure 1b).

Figure 1. Percentage of students using internet at home by country and by type of activity

1a. Percentage of 15 years old students using internet at home



1b. Percentage of 15 years old students using the internet or the email for entertainment or schoolwork at least once a week



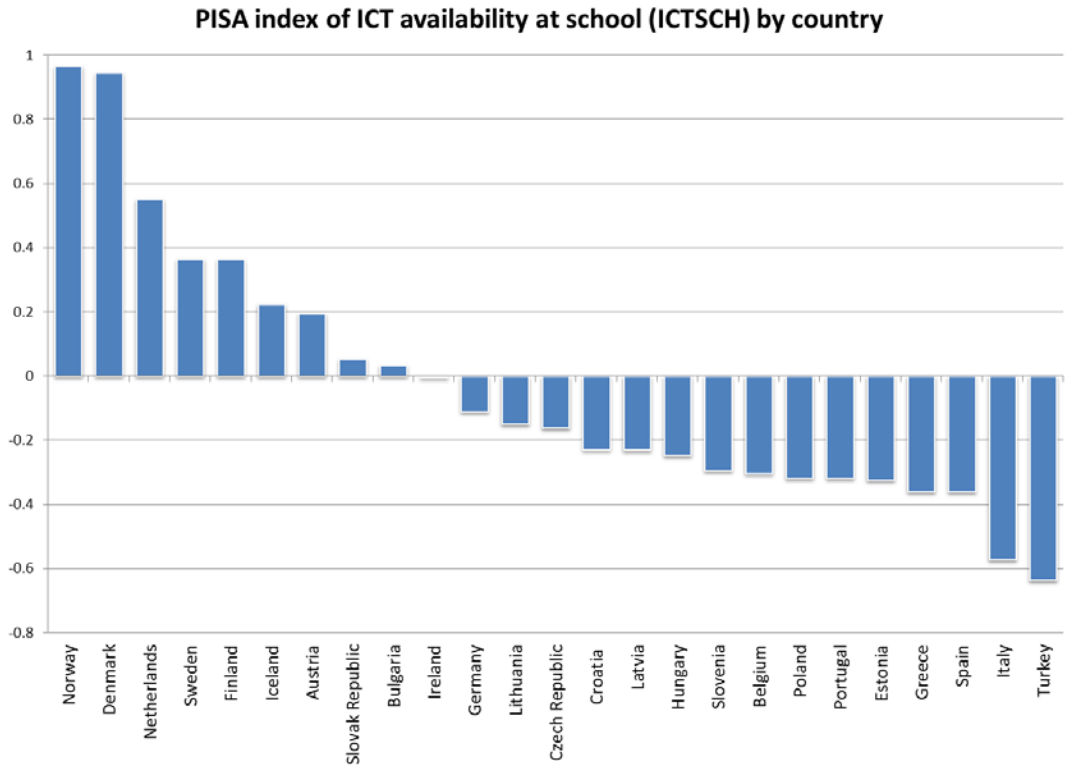
Note: the EU average is a weighted average where the contribution of each country is proportional to the size of the country's 15 years old population

Source: authors' estimates using PISA ICT 2009

[4] In alphabetic order: BE-NL(51.9%), BG (51.1%), DK (61.1%), EE (50.5%), HU (50.5%), NL (53.2%), PL (56.7%), PT (60.7%), and NO (63.7%).
[5] In alphabetic order: DK (92.8%), EE (93.2%), SI (90.2%), FI (93.7%), SE (93.9%), IS (93.3%), and NO (94.5%).

Fig. 2a reports the values for the PISA Index on ICT availability at school[6] (in terms of deviations from the standardized OECD mean), while Fig.2b reports the values for the computers-to-students ratio. It appears evident that there are large variations among the analyzed countries and that Norway, Denmark, Netherlands, Iceland and Austria are the countries that show the highest values for both measures.

Fig. 2a: Indexes of ICT availability at school, by country



[6] The index of ICT availability is a composite index of different types of ICT available at school. It includes PCs, printers, Internet etc.

Fig. 2b: Computers-to-students ratio, by country

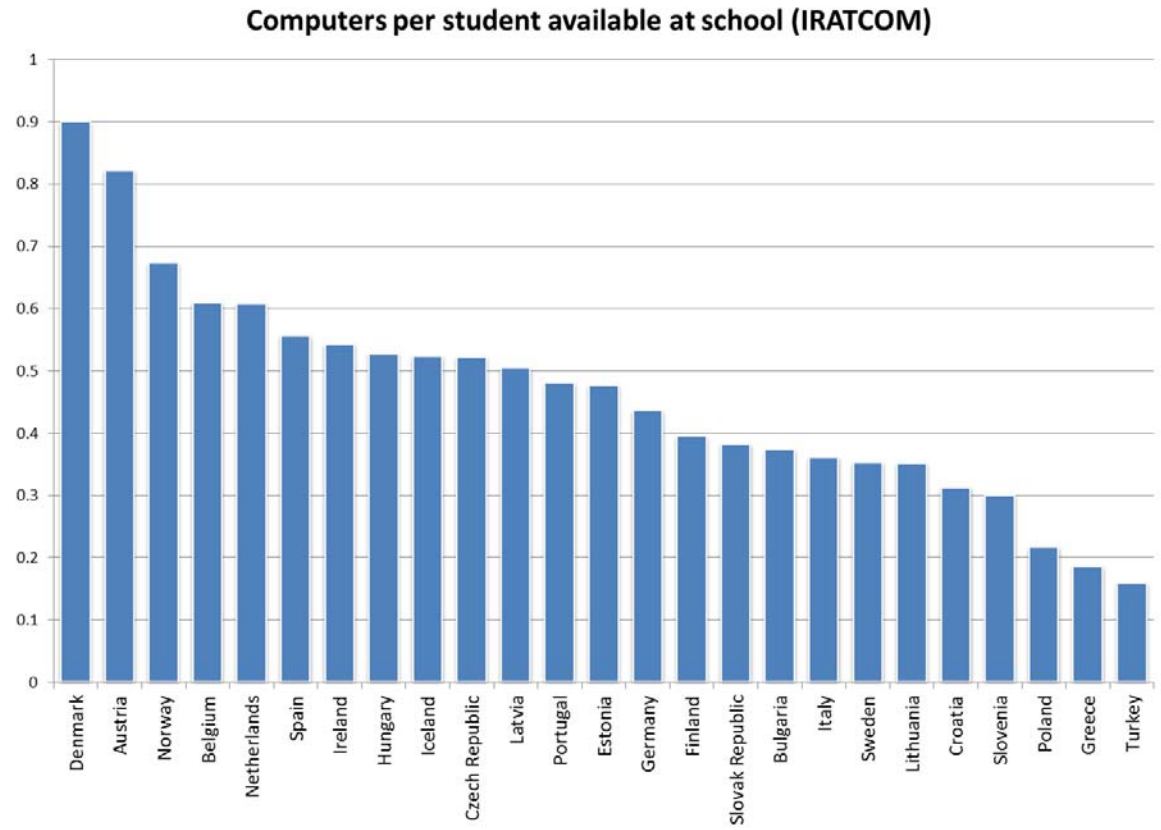
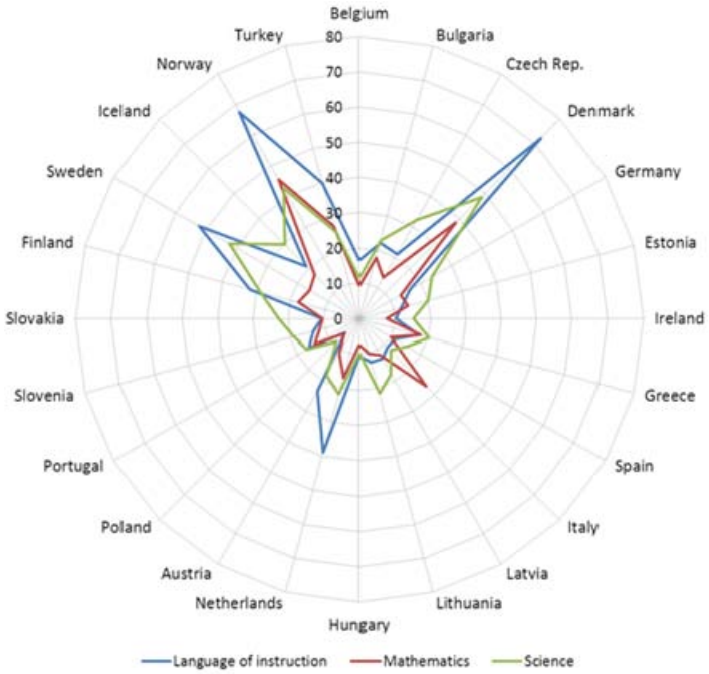


Fig.3 Percentages of ICT use at school, by country



EU average by PISA domain		
Language of instruction	Mathematics	Science
17.2	14.4	18.9

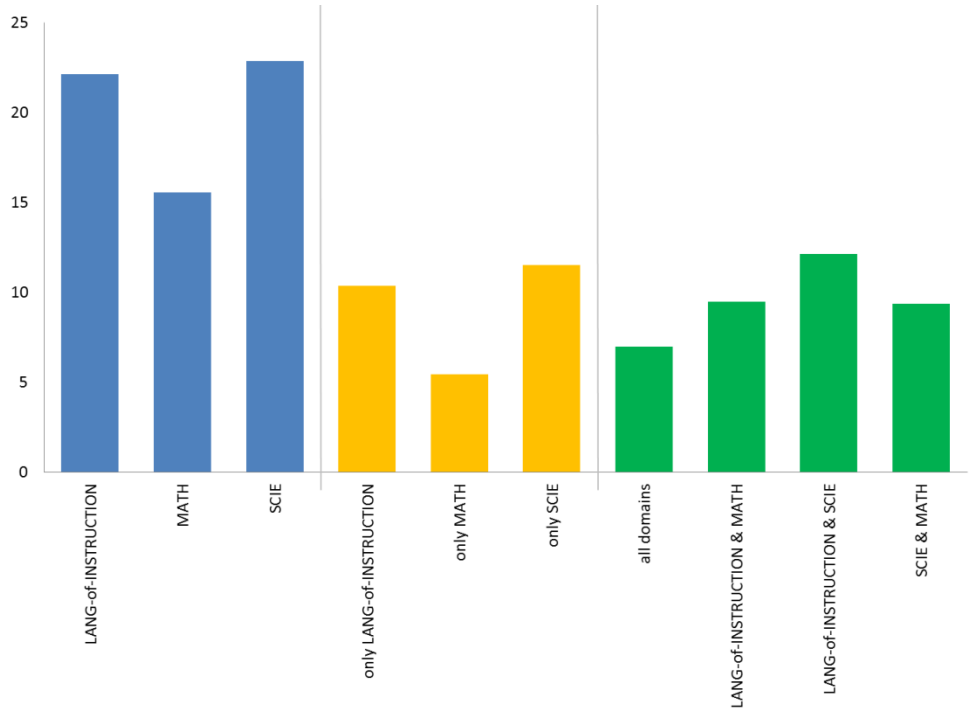
NOTE: Weighted average where the contribution of each country is proportional to the size of the country's 15 years old population

For the first time, the latest wave of the OECD-PISA study asked students if, and how intensively, they use computers for classes of language-of-instruction, mathematics or science during a typical school week. The information provided by this question is synthesized in Figure 3. On average, across European countries, a smaller percentage of students use computers during mathematics lessons (14.3%) than during language-of-instruction or science classes (17.1% and 18.8%, respectively). There are substantial variations between countries and between subjects. Denmark and Norway show the highest proportion of students using computers in all the three subjects covered by the OECD-PISA survey; on the contrary, Hungary and Poland are the countries where students less likely use computers during language-of-instruction, mathematics or science classes. Moreover, a substantial share (40% or more) of the 15 years old students living in the Netherland and Sweden declare to use computer during language-of-instruction lessons and, only for Sweden, also during science classes.

A proxy measure for the general use of computers at school for educational purposes can be obtained computing the percentage of students declaring to use a computer during classroom lectures of at least one of the three PISA domains. This measure shows that, despite the fact that 91% of the European students attend schools with computers available for instruction that are connected to the internet (OECD-PISA 2009), ICT are widely used only by schools in Denmark, Norway, Sweden, Finland and the Netherlands (Fig.2a).

Furthermore, Figure 3 reveals that in these five Northern countries the likelihood to use a computer during language-of-instruction classes is higher than the likelihood to use a computer during science lessons, which in turn is superior to the likelihood to use a computer during mathematics lessons. In all remaining countries but Austria, Belgium and Italy, the share of students declaring to use a computer during science lessons is higher than the share of students using this device in the two other domains.

Figure 4. Percentage of students using computers at least some time during classroom lectures



Our econometric analysis is mostly based on Q4, Q5 and Q6 of the ICT familiarity questionnaire, which are meant to capture the use of ICT, both at home and at school. Q4 refers mainly to entertainment uses of ICT at home, while Q5 and Q6 capture school related activities (respectively at home and at school).

Q4 **How often do you use a computer for following activities at home?**

(Please tick one box in each row)

	Never or hardly ever	*Once or twice a month*	*Once or twice a week*	*Every day or almost every day*
a) Play one-player games	☐ 1	☐ 2	☐ 3	☐ 4
b) Play collaborative online games	☐ 1	☐ 2	☐ 3	☐ 4
c) Doing homework on the computer	☐ 1	☐ 2	☐ 3	☐ 4
d) Use e-mail	☐ 1	☐ 2	☐ 3	☐ 4
e) <Chat on line> (e.g. <MSN®>)	☐ 1	☐ 2	☐ 3	☐ 4
f) Browse the Internet for fun (such as watching videos, e.g. <YouTube™>)	☐ 1	☐ 2	☐ 3	☐ 4
g) Download music, films, games or software from the Internet	☐ 1	☐ 2	☐ 3	☐ 4
h) Publish and maintain a personal website, weblog or blog	☐ 1	☐ 2	☐ 3	☐ 4
i) Participate in online forums, virtual communities or spaces (e.g. <Second Life® or MySpace™>)	☐ 1	☐ 2	☐ 3	☐ 4

Q5 **How often do you do the following at home?**

(Please tick one box in each row)

	Never or hardly ever	*Once or twice a month*	*Once or twice a week*	*Every day or almost every day*
a) Browse the Internet for schoolwork (e.g. preparing an essay or presentation)	☐ 1	☐ 2	☐ 3	☐ 4
b) Use e-mail for communication with other students about schoolwork	☐ 1	☐ 2	☐ 3	☐ 4
c) Use e-mail for communication with teachers and submission of homework or other schoolwork	☐ 1	☐ 2	☐ 3	☐ 4
d) Download, upload or browse material from your school's website (e.g. time table or course materials)	☐ 1	☐ 2	☐ 3	☐ 4
e) Check the school's website for announcements, e.g. absence of teachers	☐ 1	☐ 2	☐ 3	☐ 4

Q6 **How often do you use a computer for following activities at school?**

(Please tick one box in each row)

	Never or hardly ever	*Once or twice a month*	*Once or twice a week*	*Every day or almost every day*
a) <Chat on line> at school	☐1	☐2	☐3	☐4
b) Use e-mail at school	☐1	☐2	☐3	☐4
c) Browse the Internet for schoolwork	☐1	☐2	☐3	☐4
d) Download, upload or browse material from the school's website (e.g. <intranet>)	☐1	☐2	☐3	☐4
e) Post your work on the school's website	☐1	☐2	☐3	☐4
f) Play simulations at school	☐1	☐2	☐3	☐4
g) Practice and drilling, such as for foreign language learning or mathematics	☐1	☐2	☐3	☐4
h) Doing individual homework on a school computer	☐1	☐2	☐3	☐4
i) Use school computers for group work and communication with other students	☐1	☐2	☐3	☐4

There are various ways to read the information provided by Q4, Q5 and Q6.

On the one hand, these questions distinguish between the location of the use of ICT: home vs. school. On the other one they also distinguish between the purpose of the activity: some of them are school related (even if performed at home) while others are mostly entertainment related. Finally, these activities involve different skills: some of them are more related to information gathering, while others support collaboration or communication and sharing (to name just a few), irrespective of the location at which they are performed.

Table 2 shows how students use computers at school. It contains the share of students, computed on the whole dataset (column 1) and by PISA domain (column 3 to 4), performing one of the following nine activities at least once a week: *chat on line*; *use e-mail*; *browse the internet for school work*; *download, upload or browse material from the school's website*; *post work on the school's website*; *play simulations at school*; *practice and drilling, such as for learning a foreign language and mathematics*; *do*

individual work on a school computer; *and use school computers for group work and to communicate with other students* (Q6 of the PISA-ICT questionnaire). Students who reported to do the listed activities at least once a week are considered frequent users. Overall, 45% of the students declared that they frequently browsed the internet for school work and more than 26% reported a frequent use of school computers for group work and communicating with other students. At least 15% of the students declared to frequently download, upload or browse material from the school website, use a school-computer to practice and drill (17%), do individual homework on a school computer (18%), chat on-line at school (18%), and use e-mail at school (21%). Finally, less than 15% of the students declared to use a school-computer at least once a week to play simulations (11%) or to post homeworks on the school's website (10%).

Table 2. Percentage of student doing one of the following activities at school at least once a week

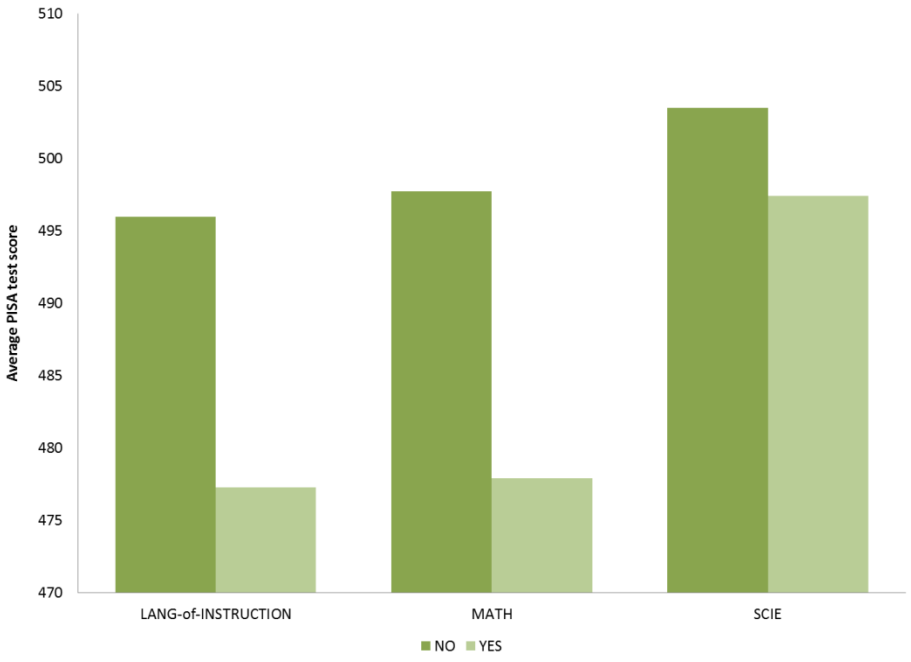
	Pooled sample	only LANG-OF-INSTRUCTION	only MATH	only SCIE
Browse the Internet for schoolwork from the school's website (e.g. <intranet>)	45.01	53.56	36.86	41.04
Use school computers for group work and communication with other students	26.38	30.2	23.41	24.3
Use e-mail at school	21.24	23.31	16.54	21.49
<Chat on line> at school	18.39	21.71	15.48	17.75
Doing individual homework on a school computer	18.29	24.43	15.49	14.09
Practice and drilling, such as for foreign language learning or mathematics	17.42	16.44	26.22	14.4
Download, upload or browse material	15.82	17.97	14.9	14.33
Play simulations at school	10.57	11.02	13.02	9.08
Post homeworks on the school's website	9.82	12.83	9.56	7.27

Source: authors' estimates using PISA ICT 2009

Table 2, columns 2 to 4, show how these activities are distributed across students declaring to use computers at school in only one of the three PISA domains. Generally speaking, the likelihood of performing one of the listed activities at least once a week is higher for students using computers exclusively during language-of-instruction lectures than for students using computers only during science lectures, which in turn is higher than the one of students using computers exclusively during mathematics classroom lectures. *Practice and drilling* and *play simulations at school* are the main exceptions. These two activities, aiming at developing principally students' problem-solving skills, are performed more often during mathematics lectures than within the two other domains. Minor exceptions concern the likelihood to *do homework on a school computer* or to *post homeworks on the school website* at least once a week, that is lower during science lectures.

Figure 5 illustrates the relationship between students' PISA score and the use of computer at school during classroom lectures by domain. The dark-tone bars represent the average score of students non-using computers during lessons, while the light-tone bars represent the average score of students using computers at school.

Figure 5. Students' achievement and use of computers at school during lecture by PISA domain



This figure (Figure 5) apparently tells us two things: first, that, regardless the domain, students not using computers during lectures outperform students that declare to use computers at least some time per week during classroom lectures; second, the gap in performance is particularly marked within the language-of-instruction and the mathematic domains. However, adjusted Wald F-tests reveal that the PISA scores do not differ significantly across these two groups of students reinforcing the "*no significant difference phenomenon*" hypothesis proposed by Russel (2001)[7].

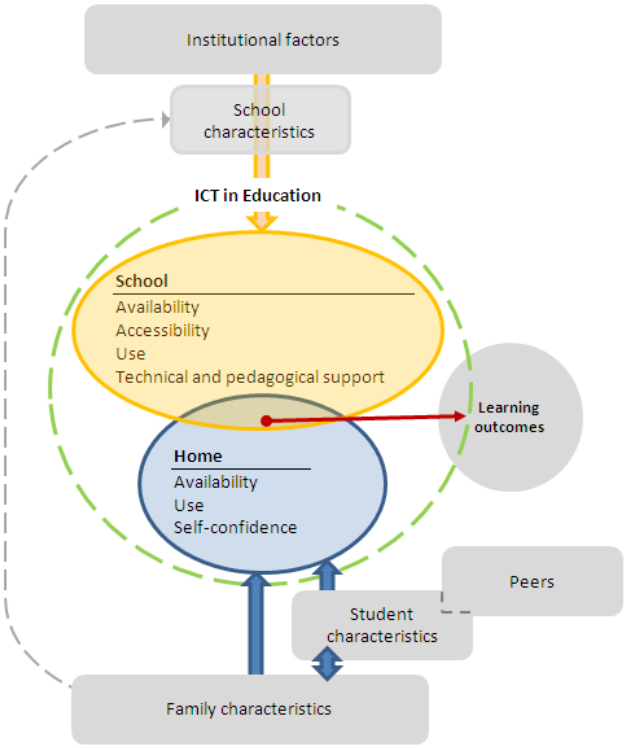
It is clear that such a bivariate analysis is not conclusive, since it does not control for other factors that might affect the impact of ICT use on students' achievement such as student, family and school characteristics (Figure 6).

Students' characteristics (i.e. gender, migration background and grade of enrollment) as well as family characteristics (i.e. socio-economic status and family structure) influence the way ICT is used and adolescents' confidence in using the new technologies[8]. The relationship between family/student characteristics and availability/use of ICT at home is synthesized by the lower half of Figure 6.

[7] Sample surveys like PISA have complex sampling design with multistage sampling and stratification. To take into account these characteristics, the mean scores of the students belonging to each of the groups considered in this analysis (users and non-users of computers during classroom lectures) have been computed estimating the corresponding variance through balanced repeated replication (BRR) methods. In this circumstance, the adjusted Wald F-tests is generally used as a substitute of the more classical t-test. The results of the tests are the following: Language-of-instruction: $F(1, 79) = 1.02$, $Prob > F = 0.3155$; mathematics: $F(1, 79) = 1.47$, $Prob > F = 0.2282$; science: $F(1, 79) = 0.98$, $Prob > F = 0.3250$.

[8] Notten et al. (2009) show that students from high socio-economic and two-parents family households have more likely internet access at home than children from lower-status families, and use the web more frequently to gain information and to extend their social networks. Concerning the relationship between students' gender and use of new technologies, previous research demonstrates that female students use internet less often than male students (Notten et al., 2009, Livingstone and Helpser, 2007) and that males tend to use computers and internet more for entertainment than for school related tasks (i.e. Tømte and Hatlevik, 2011; Ainley et al. 2008). Moreover, individual and family characteristics affect students' attitude toward computers, generally defined as students' self-assessed capability in performing various ICT tasks (i.e. Zhong, 2011; Ainley et al. 2008; Broos, 2005). For example, Zhong (2011) finds a positive relationship between adolescents' socio-economic status, home ICT access and their self-reported digital skills. On this point, Ainley et al. (2008) show not only that, on average, males tend to report higher levels of confidence about their ability in using ICT than females, but also that this gap is particularly pronounced for high-level tasks, with the largest differences observed for creating a web page or creating a multimedia presentation. Finally, it is reasonable that the way students use ICT and their self-confidence in using them are influenced by interaction with peers (i.e. classmates, out-of-school friends, brother(s)/sister(s)).

Fig.6 Conceptual framework



Findings of two recent international studies conducted by the International Association for Evaluation of Academic Achievement (namely the Second International Technology in Education Study – SISTES 2006 – and the Trends in International Mathematics and Science Study – TIMSS 2007) highlight the role of school-level factors in exploiting the potential of ICT in education. The literature identifies two main sets of barriers that make it difficult to achieve the effective integration of ICT in education. The first concerns school principals and teachers' behavior and knowledge (see Pelgrum 2008; Law and Chow, 2008; Brummelhuis and Kuiper, 2008), while the latter refers to schools' technological equipment including software, internet connectivity and technical and pedagogical support (Eurydice 2009 and 2011).

Figure 6 takes in to account the fact that school characteristics may be not independent from family characteristics (dashed line) in the sense that, for example,

families with a higher socio-economic background have the possibility to choose for their children schools that are better equipped.

Institutional-level factors play a role in moderating or accentuating these two barriers. Many countries suggest or recommend in their official documents the use of ICT for teaching, offering support (practical advices and help for lesson planning, effective teaching, classroom management, use of various resources, etc.) for the effective integration of these tools in education (see Condie and Munro, 2007), Finally, countries play a central role in promoting policies (national and local) aiming at providing teachers with knowledge and skills to integrate ICT in their teaching activities. In this regard it is noteworthy that, across Europe, most of the countries do include ICT in initial teacher training, provide ICT-related continuing professional development opportunities and evaluate periodically teachers' ICT skills (Eurydice, 2011).

The relationship between institutional/school factors and availability/use of ICT at school is synthesized by the upper half of Figure 6.

Finally, the proposed framework highlights that the effect of ICT on students' learning outcomes (the horizontal arrow in Figure 6) results from the interaction between the availability and use of the new technologies that is done at home and at school (the intersection between the upper and the lower ovals in Figure 6).

Having presented our conceptual framework in broad terms we now need to relate it to the information actually available in PISA 2009.

3 Our empirical specification

The first problem we encounter is how to summarize in an informative and concise way the main info provided by Q1 to Q6 (the conceptualization issue). The second one is related to the choice of the appropriate controls for the covariates potentially interesting for us and hence to the reduced form to be estimated (the functional form issue).

On the first point, in this work we categorize ICT utilization based on the type of skills involved in each activity (and hence not so much on the location of the activity per se). We have been inspired by a recent study by the JRC-IPTS Information Society Unit on Digital Competences containing an interesting conceptualization concerning the different

domains in which digitalization and competences interact. Based on this categorization we assign activities reported in Q4, Q5 and Q6 to the appropriate group as follows:

1) Gaming activities. These include:

- Play one-player games
- Play collaborative online game

2) Collaboration and Communication activities, whose content is defined as: link with others, participate in online networks and communities, interact constructively and responsibly; communicating through online tools, taking into account privacy, safety and etiquette. We have assigned to this group the following activities considered by the latest ICT familiarity questionnaire:

- Use e-mail
- Chat on line
- Publish and maintain a personal website, weblog or blog
- Participate in online forums, virtual communities
- Use e-mail for communication with other students about schoolwork
- Use e-mail for communication with teachers and submission of homework or other schoolwork
- Chat on line at school
- Use e-mail at school
- Use school computers for group work and communication with other students

3) Information Management and Technical Operations, whose content is defined as: identify, locate, access, retrieve, store and organize information; use technology and media, perform tasks through digital tools. We have assigned to this group the following activities considered by 2009 ICT optional questionnaire:

- Browse the Internet for fun
- Download music, films, games or software from the internet
- Browse the Internet for schoolwork
- Download, upload or browse material from your school’s website
- Check the school’s website for announcements

- Browse the Internet for schoolwork

- Download, upload or browse material from your school's website

- Post your work on the school's website

4) Creation of Content and Knowledge and Problem Solving activities, whose content is defined as: integrate and re-elaborate previous knowledge and content, construct new knowledge; define problems to be solved or tasks to be achieved and resources and means for achievement. We have assigned to this group the following activities considered by 2009 ICT familiarity questionnaire:

- Play simulations at school

- Practice and drilling, such as for foreign language learning or mathematics

- Doing individual homework on a school computer

Then, for each type/group of activity we create an index of intensity of use, defined by the ratio of the total score for that activity obtained by a given student over the maximum available score for the same activity[9]. Such variable measures **intensity in the use** of ICT in a given activity. We also consider the **total number of activities** performed across the different groups[10]. By doing this we have both a measure of group-specific intensity and a measure of the total number of activities performed by any given individual (Model 1).

Hence we create the following explanatory variables: *games_int* (measuring the intensity in the use of ICT for gaming activities); *colcom_int* (measuring intensity in the use of ICT for communication and collaboration activities); *techinfo_int* (measuring intensity in the use of ICT for technical operations and for info retrieval activities); *contprob_int* (measuring intensity in activities related to creation of content and knowledge and problem solving); *totactivities* which measures the total number of activities that involve the use of ICT (irrespective of the intensity in them).

[9] For instance, the maximum available for gaming activity is 8 given that in this group there are only two activities and that the maximum score on each activity is 4.

[10] We sum the number of activities in which the students declare a score higher than zero, i.e. activities that are actually performed by him or her.

We then run OLS regressions where the PISA score in reading and math[11] (one at a time, for each student) is regressed against a set of explanatory variables. In addition to the measures of intensity and breadth of ICT use computed as explained above, we consider the following variables: grade, gender, socio economic status of the family (which is an index created by the OECD capturing both income and education related household variables), dummy variables capturing the family composition (single parents, mixed families), dummy variables for the number of books available at home, peer-effects as captured by the average school score in the appropriate test (i.e. math or reading). We also allow for interactions between our main explanatory variables (intensity of ICT use and breadth of ICT, as defined above) and the variable capturing the household socio economic status, in order to verify whether ICT use tends to increase pre-existing social and economic differences.

As an alternative specification (Model2), instead of the measures of intensity for the various groups plus the total number of activities performed, we used as regressors the standardized values for the total score obtained by each individual in reference to a given group. Such variables, by construction, have a mean equal to 0 and a standard deviation of 1. So that standardized values for each individual should be read as changes from the mean. The variables generated by us are: *Stz_games*, *Stz_colcomm*, *Stz_techinfo*, *Stz_contprob*. In this specification as well we control for the same student, family and school characteristics as in Model 1, including interactions between the standardized variables and the household socio-economic status.

The analysis is conducted separately for each country and for each PISA score (math and reading), using the methodology suggested in the OECD PISA 2009 manual, which takes into account the special nature of the sampling used for PISA (we use the balanced repeated replication method).

Our results indicate that there are very consistent patterns across the different countries.

The following tables summarize our results; country specific estimates are in the appendix

[11] These are the two main PISA domains. In a future version we will also consider the science domain.

Model 1: Summary of main results

Variable	MATH		READ	
games_int	+ (15/23)		+ (11/23)	- TUR
colcom_int	- (14/23)	+ SVK	- (15/23)	+ PRT
techinfo_int	- (17/23)	+ NOR	- (16/23)	+ NOR
contprob_int	- (19/23)		- (21/23)	
totactivities	+ (18/23)		+ (22/23)	

The numbers in the parenthesis indicate the total number of countries satisfying the sign set on the left of the parenthesis. For instance, we find a positive and significant coefficient for the relationship between the PISA score and our measure of intensity in gaming activity (*games_int*) in 15 countries over 23. When looking at the relationship between PISA scores and our measure of intensity in the use of ICT for communication and collaboration activities (*colcom_int*) we find a negative and significant coefficient in 14 over 23 countries (with the exception of a positive and significant coefficient for the Slovak Republic).

Model 2: Summary of main results

Variable	MATH		READ	
Stz_games	+ (20/23)		+ (17/23)	
Stz_colcomm	- (12/23)	+ SVK	- (10/23)	+ PRT
Stz_techinfo	- (14/23)	+ NOR	- (12/23)	+ NOR, SWE
Stz_contprob	- (19/23)		- (21/23)	

Here we summarize the results for Math:

Across both Model 1 and Model 2 we consistently find the following results:

- Gender dummy: negative and significant effect on the female dummy variable in all the countries, with size of coefficient varying (also significance levels)
- Peer effects: positive and significant in all the countries (value of coefficient is quite close among countries)
- Dummies for number of books: generally positive and increasing in the number of books. Some variation across countries.

When focusing on Model 1, we also get the following:

- Household socio-economic status (*ESCS*): in general no evidence of significant coefficient, with the exceptions of Poland (negative) and Slovenia (positive)
- *colcom_int*, *techinfo_int*, and *contprob_int*, when significant, enter with a negative coefficient. The exceptions are Slovak Republic (for *colcom_int*) and Norway (for *techinfo_int*). The only ICT use variable that, when significant, enters with a positive coefficient is *games_int*. The values of the coefficients vary across countries, but the sign does not.

- The interactions between *games_int*, *colcom_int*, *techinfo_int*, *contprob_int* and the variable capturing the socio economic status (*ESCS*) tend to be not significant. More specifically:

  - for interactions between *games_int* and *ESCS* we find a negative and significant coefficient for Bulgaria and a positive and significant one for Hungary;

  - for interactions between *colcom_int* and *ESCS* we find a negative and significant coefficient for Poland, Slovak republic and positive and significant for Greece;

  - for interactions between *techinfo_int* and *ESCS* we find a negative and significant coefficient for Czech Rep., Denmark, Estonia, Iceland, Italy;

  - for interactions between *contprob_int* and *ESCS* in no country we find a significant coefficient.
- In the vast majority of countries the variable capturing the total number of activities that involve the use of ICT (*totactivities*) enters with a positive (and significant) coefficient. In no country it has a (significant) negative coefficient.
- The interaction between *totactivities* and *ESCS* tends to be not significant (only in few countries –Czech Republic, Norway, Poland and Turkey- it is significant with a positive coefficient, while only in one country – Slovenia- it has a significant negative coefficient).

Using Model 2 for Math we get the following results:

- *ESCS*: in general evidence of significant and positive effects, with the exceptions of Spain, Croatia, Hungary, Italy and Slovenia (no significant effect).
- *Stz_games*: when significant it enters with a positive coefficient (20/23).
- *Stz_colcomm*: in 12 countries in enters with a (significant) negative coefficient while in only 1 country – Slovak republic- it has a (significant) positive coefficient.
- *Stz_techinfo*: in 14 countries in enters with a (significant) negative coefficient while in only 1 country – Norway - it has a (significant) positive coefficient.
- *Stz_contprob*: in 19 countries in enters with a (significant) negative coefficient while in no country it has a (significant) positive coefficient.

When we consider the interactions with *ESCS* we find:

- *Stz_games* and *ESCS*: in general no evidence of significant interaction, with the exceptions of Bulgaria and Portugal (negative) and Hungary (positive).
- *Stz_colcomm* and *ESCS*: in general no evidence of significant interaction, with the exceptions of Greece (positive) and Slovak republic (negative).
- *Stz_techinfo* and *ESCS*: in general no evidence of significant interaction, with the exceptions of Denmark, Greece and Italy (negative).
- *Stz_contprob* and *ESCS*: in general no evidence of significant interaction, with the exceptions of Bulgaria and Spain (negative).

Across both Model 1 and Model 2 for the Reading domain we consistently find the following results:

- Gender: positive and significant effect on the female dummy variable in all the countries, with size of coefficient varying (also significance levels)
- Peer effects: positive and significant in all the countries (value of coefficient is quite close among countries)
- Dummies for number of books: generally positive and increasing in the number of books. Some variation across countries.

When running Model 1 for Reading we obtain the following:

- *ESCS*: in general no evidence of significant interaction, with the exceptions of Finland and Sweden (positive) and Czech Republic (negative).
- The variable *games_int* is positively correlated with students' reading performance in 11 countries (for the other it is not significant). For only one country (Turkey) it has a negative coefficient. However, *colcom_int*, *techinfo_int*, *contprob_int*, in the vast majority of countries are negatively associated with students' reading proficiency. Exceptions are Norway, where there is a positive and statistically significant correlation between students' reading proficiency and the use of ICT to perform technical operations and Portugal, where the coefficient on *colcom_int* is positive and significant at the 90^{th} confidence level

- The interactions between *games_int*, *colcom_int*, *techinfo_int*, *contprob_int* and the variable capturing the socio economic status (*ESCS*) tend to be not significant. Only in few cases we find some significant interactions. More specifically:

  - for interactions between *games_int* and *ESCS* we find a positive and significant coefficient only for Belgium and Sweden

  - for interactions between *colcom_int* and *ESCS* we find a negative and significant coefficient for Germany, Latvia, Slovak Rep. and positive and significant for Iceland.

  - for interactions between *techinfo_int* and *ESCS* we find a negative and significant coefficient for Denmark, Croatia, Ireland and Italy.

  - for interactions between *contprob_int* and *ESCS* we find a negative and significant interaction in Belgium and Spain, and a positive one in Poland.
- The coefficient on *totactivities* is correlated positively with students' reading proficiency in all the countries but Portugal.
- The interaction between *totactivities* and *ESCS* tends to be not significant (only in few countries –Czech Republic, Italy, Latvia, Poland- it is significant with a positive coefficient, while only in two countries – Finland and Slovenia- it has a significant negative coefficient)

As for Model 2 applied to Reading we get the following:

- *ESCS*: in general evidence of significant and positive effects, with the exceptions of Italy, Lithuania and Slovenia (no significant effect).
- *Stz_games*: when significant it enter with a positive coefficient (in 17 countries)
- *Stz_colcomm*: in 10 countries in enters with a negative coefficient while in only 1 country – Portugal- it has a positive coefficient
- *Stz_techinfo:* in 12 countries in enters with a negative coefficient while in only two countries – Norway and Sweden- it has a positive coefficient
- *Stz_contprob*: in 21 countries in enters with a negative coefficient while in no country it has a positive coefficient

When we consider the interactions with ESCS we find:

- *Stz_games* and *ESCS*: in general no evidence of significant interaction, with the exceptions of Belgium, Iceland and Sweden (positive)
- *Stz_colcomm* and *ESCS* : in general no evidence of significant interaction, with the exceptions of and Iceland (positive) and Germany and Slovak republic (negative)
- *Stz_techinfo* and *ESCS* : in general no evidence of significant interaction, with the exceptions of Denmark, Croatia, Ireland, Iceland, Italy, Lithuania and Sweden (negative)
- *Stz_contprob* and *ESCS* : in general no evidence of significant interaction, with the exceptions of Belgium, Spain and Ireland (negative)

4 Conclusions

First of all we should make explicit the fact that ours is not an impact assessment. For a proper impact assessment you need to take into account the endogeneity of treatment, which would require some sort of Instrumental Variables techniques, which we could not find in the PISA dataset (variables that affect only the likelihood of treatment but not the outcome). Hence, what we capture here are correlations. But some of these correlations are quite interesting, since they go in opposite directions of what we expected ex ante.

First, gaming, when significant, is positively correlated with students' PISA test score.

For the remaining activities, our measures of intensity tend to be negatively correlated with students' PISA test score (exceptions are Norway, Slovak republic, Portugal and Sweden). Moreover, this negative effect is particularly strong for the Creation of Content and Knowledge and Problem Solving activities, which appear to be highly related to the use of ICT in the school curriculum. These are:

- Play simulations at school
- Practice and drilling, such as for foreign language learning or mathematics
- Doing individual homework on a school computer

These results seem to point out to some negative correlation between the use of ICT (in terms of either intensity or deviations from the mean) and cast doubts on the effectiveness of the money spent of ICT related investments in EU and non EU schools.

However the number of activities (and hence the diversification of activities), irrespective of the intensity of ICT use, is positively correlated with students' PISA score in the vast majority of countries. This might be an indication that ICT breadth of use, as opposed to intensity in a given activity, has some positive effect on students' performance. This might be the result of two potentially complementary effects. On the one hand, a more intensive use of ICT in any given activity tends to subtract time to other perhaps more fruitful activities (such as studying for exams). Moreover, the diversity in the use of ICT might stimulate complementary skills and competences that turn out to be valuable for the performance of students at the PISA test.

Finally, we have to remember that PISA tests might not be able to capture properly the abilities that are mostly related to an intensive use of ICT. To the extent that such test tends to focus on abilities typically related with traditional teaching techniques, one should not expect to see any positive effect of intensive ICT utilization. Moreover, the PISA dataset does not allow us to have granular information on the type of utilization of ICT at the school level. In particular, we do not know whether ICT are just added into a traditional curriculum or whether they actually shape –at least partially- the curriculum. This is important since we do not expect any particular benefit coming from the utilization of ICT into a fully traditional CV. Future research should try to gather more and better data on such fundamental issues.

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APPENDIX

MATH MODEL 1

VARIABLES	BEL	BGR	CZE	DEU	DNK	ESP	EST	FIN	GRC	HRV	HUN	IRL	ISL	ITA	LTU	LVA	NOR	POL	PRT	SVK	SVN	SWE	TUR
ESCS	9.134	4.998	-28.87	-31.02	-8.791	5.699	4.736	98.77	10.17	5.250	-75.35	-1.569	-1.021	-2.211	-16.45	-12.03	-18.00	-30.75**	-9.743	-8.184	49.75*	37.12	-11.14
	(29.33)	(11.39)	(18.24)	(31.29)	(32.47)	(12.98)	(24.03)	(83.63)	(6.241)	(11.56)	(48.00)	(27.93)	(19.52)	(5.617)	(38.03)	(18.16)	(22.23)	(10.33)	(24.09)	(24.91)	(22.15)	(27.40)	(6.666)
Average score at school	0.689***	0.788***	0.846***	0.797***	0.751***	0.615***	0.822***	0.836***	0.803***	0.883***	0.847***	0.672***	0.806***	0.891***	0.736***	0.682***	0.764***	0.640***	0.420***	0.801***	0.879***	0.716***	0.858***
	(0.0121)	(0.0215)	(0.00899)	(0.0140)	(0.0231)	(0.0228)	(0.0197)	(0.0265)	(0.0199)	(0.0126)	(0.0113)	(0.0388)	(0.0428)	(0.00773)	(0.0202)	(0.0288)	(0.0313)	(0.0259)	(0.0242)	(0.0174)	(0.0140)	(0.0239)	(0.0121)
female	-28.96***	-10.45***	-18.62***	-24.18***	-18.28***	-28.53***	-16.40***	-11.65***	-26.26***	-23.52***	-25.23***	-12.73***	-6.852*	-23.65***	-5.698*	-13.46***	-9.957**	-16.17***	-27.03***	-11.92***	-20.14***	-6.263*	-28.31***
	(1.748)	(2.222)	(2.239)	(1.880)	(2.456)	(1.706)	(2.878)	(3.182)	(2.343)	(2.059)	(1.863)	(2.217)	(2.971)	(0.942)	(2.770)	(2.483)	(3.102)	(2.455)	(2.073)	(2.530)	(2.399)	(2.518)	(1.424)
grade7	-48.64**	-12.64	-53.50***	-106.2***	-39.50	-77.02***	-119.6***	-70.04**	-5.338		-3.632			-16.43	-80.14***	-72.85***		-82.45***	-66.13***	-51.38**		-123.4***	-13.78
	(15.54)	(13.92)	(10.62)	(12.02)	(39.37)	(18.35)	(11.53)	(20.08)	(29.34)		(6.885)			(13.41)	(21.22)	(9.987)		(17.75)	(6.521)	(19.33)		(18.67)	(11.20)
grade8	-57.44***	-23.47*	-34.14***	-66.35***	-41.80***	-87.22***	-68.90***	-45.60***	44.80**	-8.958	-3.198	-59.60***		-2.336	-42.69***	-71.53***		-74.47***	-46.62***	-28.24**	-16.97	-36.88***	1.060
	(6.749)	(9.972)	(6.526)	(4.015)	(7.715)	(6.067)	(7.065)	(10.08)	(13.74)	(4.879)	(4.164)	(12.06)		(4.764)	(5.408)	(5.642)		(12.02)	(5.538)	(9.636)	(11.44)	(9.965)	(4.571)
grade9	-33.78***	-24.40**	-2.202	-36.31***	-16.45*	-43.19***	-40.40***	-14.84	41.54**	-33.61***	-16.76***	-23.60***	-74.36***	-31.73***	-28.99***	-33.12***	-51.06**	-6.808	-6.096	4.028*	-5.470	-8.326*	-22.23***
	(3.952)	(7.595)	(1.451)	(1.947)	(7.108)	(6.421)	(6.947)	(8.775)	(12.22)	(1.874)	(1.710)	(2.994)	(19.49)	(3.318)	(3.410)	(5.023)	(17.97)	(6.383)	(3.476)	(1.678)	(4.760)	(4.106)	(2.480)
grade_above10	46.00***			52.03***		114.8***	141.5***				23.95	1.433	17.27	20.12***	82.25***	35.86	9.195		77.21***	25.02***	25.67***		26.81***
	(6.199)			(14.05)		(32.36)	(8.257)				(24.62)	(3.530)	(9.058)	(2.986)	(6.183)	(25.99)	(7.240)		(9.670)	(4.231)	(3.767)		(3.809)
graderep	-21.63***	-25.12**	-35.16***	-11.37***	-39.44***	-23.10***	-32.69***	-53.79***	-40.01**	-36.49***	-11.15***	-27.76***	-60.24***	-4.121	-46.70***	-19.26***		-16.10	-42.95***	-40.86***	-7.709	-45.18***	-21.22***
	(3.822)	(7.848)	(6.009)	(2.737)	(5.457)	(5.824)	(5.626)	(9.559)	(14.89)	(6.766)	(2.903)	(3.642)	(16.26)	(3.453)	(6.108)	(5.449)		(9.669)	(3.232)	(7.154)	(8.663)	(5.764)	(3.380)
native	6.403*	23.49	12.91**	6.351*	19.08***	6.987*	10.40**	12.37	3.206	2.945	5.927	5.966	18.43	13.31***	12.04	11.99**	3.904	-186.2***	7.499*	8.639	13.14***	8.535*	-56.76***
	(2.652)	(17.16)	(4.732)	(2.426)	(3.266)	(2.670)	(3.547)	(7.087)	(3.376)	(2.839)	(5.478)	(5.396)	(10.23)	(2.149)	(6.271)	(4.318)	(4.643)	(9.249)	(3.449)	(10.96)	(3.780)	(3.550)	(10.10)
single_parent	0.212	-5.484*	-7.375**	1.378	5.681*	-2.046	-1.597	-10.77***	-0.0271	-1.827	-0.106	-4.407	-8.981*	3.033*	-3.142	2.409	0.754	-12.34***	2.535	-5.529	-5.848	-2.730	-4.092
	(1.922)	(2.561)	(2.160)	(2.178)	(2.831)	(2.166)	(2.163)	(2.899)	(3.673)	(2.706)	(2.043)	(3.573)	(3.678)	(1.318)	(2.387)	(2.305)	(3.057)	(3.071)	(2.541)	(2.819)	(2.968)	(3.855)	(3.203)
mixed_family	-20.41*	-14.66**	-19.74	-6.247	-13.22	-3.073	-19.41***	-23.74	-35.11***	-36.97**	-8.004	-25.52*	-60.60***	-15.29*	-16.74*	-22.08***	-28.99**	-46.00***	-6.569	-27.35**	-36.11***	-31.33***	-25.85***
	(9.953)	(5.314)	(12.14)	(13.92)	(14.54)	(7.294)	(4.643)	(13.99)	(6.451)	(12.32)	(6.694)	(11.89)	(15.60)	(5.861)	(8.315)	(6.192)	(8.772)	(7.218)	(5.140)	(8.726)	(8.377)	(6.984)	(3.675)
books_11_25	14.24***	0.466	11.21**	3.284	14.84***	20.09***	7.958	16.96*	-0.447	8.318**	17.08***	20.19***	18.57*	3.677*	-0.984	-1.172	22.44***	5.480	1.641	15.13***	-2.986	7.634	8.341***
	(3.547)	(4.859)	(4.201)	(3.520)	(3.794)	(3.507)	(5.638)	(6.836)	(3.876)	(2.694)	(4.732)	(3.866)	(7.464)	(1.659)	(2.661)	(3.929)	(5.278)	(3.677)	(3.087)	(4.416)	(3.567)	(5.238)	(2.071)
books_26_100	25.46***	27.01***	21.27***	10.02***	24.38***	35.16***	16.46***	30.08***	12.41***	19.32***	25.35***	36.32***	31.81***	15.64***	20.06***	16.13***	41.46***	25.17***	15.43***	24.83***	12.61***	23.07***	17.31***
	(2.927)	(4.510)	(3.821)	(2.909)	(3.313)	(3.390)	(4.525)	(5.016)	(3.627)	(2.407)	(4.337)	(3.753)	(7.328)	(1.659)	(2.839)	(4.197)	(4.659)	(3.036)	(3.115)	(3.946)	(3.202)	(4.856)	(2.291)
books_101_200	35.06***	34.24***	32.68***	14.95***	33.77***	52.26***	23.84***	42.90***	29.88***	27.20***	37.14***	52.35***	48.95***	20.20***	26.35***	23.93***	61.11***	43.42***	19.78***	35.22***	30.70***	23.36***	23.02***
	(3.679)	(5.876)	(3.763)	(3.416)	(4.292)	(4.540)	(4.602)	(5.546)	(4.500)	(3.922)	(4.365)	(4.252)	(6.893)	(1.773)	(3.407)	(4.494)	(5.170)	(4.238)	(3.528)	(4.190)	(4.100)	(5.388)	(2.854)
books_201_500	36.59***	33.58***	41.78***	31.35***	49.03***	58.48***	31.45***	56.20***	39.38***	34.12***	41.60***	59.16***	71.25***	30.25***	31.12***	36.07***	78.23***	48.35***	36.25***	47.01***	35.93***	56.53***	22.77***
	(3.571)	(5.836)	(4.275)	(3.615)	(4.202)	(4.692)	(5.304)	(5.330)	(5.228)	(4.230)	(4.811)	(4.437)	(7.305)	(1.858)	(4.296)	(4.601)	(5.066)	(5.023)	(4.002)	(4.799)	(4.545)	(5.325)	(3.916)
books_more500	41.35***	36.56***	45.44***	25.98***	43.55***	58.35***	41.29***	63.43***	36.97***	25.39***	52.39***	56.28***	62.75***	28.45***	41.04***	34.49***	78.85***	58.25***	20.37***	52.57***	26.14***	55.24***	20.47***
	(3.964)	(6.379)	(4.941)	(4.176)	(5.883)	(4.528)	(5.919)	(6.411)	(5.744)	(5.262)	(5.069)	(6.594)	(7.768)	(2.332)	(4.358)	(5.814)	(5.925)	(6.211)	(5.190)	(6.270)	(5.653)	(5.910)	(3.640)
totactivities	2.348**	1.671*	6.407***	2.409	4.015	1.955	5.698***	16.26***	2.396***	1.821*	9.526**	5.364**	4.473**	2.130***	5.722**	3.325***	2.772*	4.225***	0.964	5.532***	3.391***	3.393***	1.371
	(0.882)	(0.745)	(1.527)	(1.494)	(2.927)	(1.386)	(0.683)	(4.230)	(0.467)	(0.768)	(3.521)	(1.973)	(1.450)	(0.317)	(1.781)	(0.491)	(1.205)	(0.906)	(1.291)	(1.183)	(0.791)	(0.702)	(0.711)
tot_activities*ESCS	-0.310	0.252	2.064*	1.663	1.542	-0.225	0.612	-3.567	0.159	0.0668	3.637	0.969	0.995	0.216	1.764	1.450	2.166*	2.396***	1.166	1.293	-2.252*	-0.668	0.805*
	(1.338)	(0.537)	(0.825)	(1.414)	(1.460)	(0.606)	(1.128)	(3.827)	(0.283)	(0.556)	(2.181)	(1.274)	(0.922)	(0.249)	(1.730)	(0.818)	(1.058)	(0.517)	(1.107)	(1.124)	(1.006)	(1.275)	(0.317)
games_int	6.967**	9.306**	7.354*	17.65***	8.540*	12.96***	6.686	7.662	14.40***	6.840	8.427**	5.903	1.669	11.82***	15.15***	9.786**	11.84*	6.745	8.661**	14.63***	8.796*	-2.223	-7.079
	(2.491)	(3.343)	(3.021)	(2.809)	(3.481)	(2.660)	(3.678)	(4.298)	(4.157)	(3.489)	(2.998)	(4.035)	(5.905)	(1.704)	(3.745)	(3.142)	(4.642)	(3.443)	(3.199)	(3.359)	(3.379)	(4.999)	(3.900)
colcomm_int	-18.24**	-8.427	-12.03	-1.758	-41.63***	-3.571	-36.00***	-44.73***	-22.32**	6.799	-25.19***	-24.59**	-35.57*	3.442	-8.675	-22.76*	-68.39***	-40.32***	10.54	15.20*	-21.06**	-54.49***	13.54
	(5.856)	(9.204)	(6.303)	(7.365)	(7.453)	(4.963)	(8.686)	(9.182)	(7.106)	(6.449)	(6.790)	(7.639)	(14.94)	(3.508)	(7.693)	(8.869)	(12.37)	(9.641)	(7.636)	(6.865)	(6.198)	(11.32)	(7.795)
techinfo_int	-22.64**	2.016	-14.63*	-32.53***	-25.86**	-36.73***	-32.20***	-56.36***	-32.38***	-1.019	-18.64**	-25.18	-16.93	-45.98***	-46.14***	-53.38***	51.90***	-31.85**	-33.71***	-44.97***	-6.118	-4.041	-43.68***
	(7.596)	(10.11)	(7.201)	(7.992)	(8.433)	(6.632)	(7.925)	(12.74)	(8.676)	(9.170)	(6.697)	(13.02)	(15.21)	(4.956)	(9.438)	(9.393)	(10.11)	(9.412)	(8.166)	(6.965)	(7.861)	(12.95)	(8.523)
contprob_int	-30.69***	-35.69***	-21.43***	-25.30***	-25.60***	-26.20***	-34.06***	-16.39	-25.79***	-45.04***	-39.69***	-43.41***	-10.81	-1.252	-42.78***	-26.95***	-58.39***	-45.11***	-41.97***	-14.99*	-32.50***	-22.68**	-6.199
	(5.623)	(5.704)	(5.143)	(5.250)	(7.325)	(5.042)	(8.602)	(13.04)	(4.995)	(6.135)	(4.574)	(7.549)	(11.40)	(2.468)	(6.337)	(6.713)	(6.946)	(8.095)	(5.947)	(6.321)	(5.604)	(7.952)	(5.988)
games_int*ESCS	2.596	-7.208*	5.053	-3.639	-1.581	2.013	-0.269	0.444	-3.142	3.529	7.180*	2.207	3.266	0.576	-3.081	-3.070	-1.806	0.207	-5.064	3.664	-3.839	3.790	-1.118
	(2.782)	(2.901)	(3.102)	(3.282)	(3.463)	(2.220)	(3.828)	(4.219)	(3.891)	(3.880)	(3.033)	(4.159)	(4.797)	(1.373)	(3.766)	(3.640)	(4.109)	(3.792)	(2.545)	(3.358)	(3.450)	(3.831)	(2.733)
colcomm_int*ESCS	-5.767	1.939	-0.459	-1.607	4.723	4.817	3.091	-10.39	12.45*	-3.486	-4.457	-12.58	6.733	-0.471	-8.764	-10.91	-14.62	-21.67*	-5.060	-21.38*	2.135	-8.154	1.436
	(7.054)	(8.963)	(9.281)	(6.861)	(8.543)	(5.055)	(8.127)	(10.29)	(6.222)	(7.371)	(5.958)	(10.16)	(12.31)	(3.860)	(7.589)	(7.579)	(9.721)	(10.68)	(5.700)	(8.804)	(8.563)	(12.16)	(5.055)
techinfo_int*ESCS	10.15	8.670	-22.61*	-3.954	-24.63*	-1.535	-23.09**	-7.814	-19.04	-16.00	-10.68	-21.42	-26.92*	-9.508*	-16.51	-7.649	-14.49	-3.000	-3.798	-12.68	4.648	-5.404	-5.649
	(6.825)	(10.99)	(9.738)	(8.517)	(10.45)	(7.103)	(8.243)	(10.84)	(9.731)	(9.106)	(7.594)	(13.93)	(12.89)	(4.135)	(9.774)	(9.047)	(10.66)	(12.11)	(6.946)	(9.051)	(10.86)	(15.72)	(6.689)
contprob_int*ESCS	-5.940	-9.187	5.967	6.385	-0.118	-9.339	3.988	-20.17	0.402	1.207	-2.206	6.429	-10.06	-0.571	3.456	1.515	1.228	15.49	-4.950	7.100	-8.756	-3.046	3.906
	(5.761)	(4.972)	(6.628)	(5.499)	(7.306)	(5.578)	(7.251)	(13.01)	(5.629)	(6.789)	(5.050)	(10.42)	(10.04)	(2.665)	(5.759)	(7.186)	(8.434)	(7.830)	(4.361)	(6.939)	(6.130)	(9.720)	(3.933)
Constant	133.0***	56.58*	-73.45*	83.60*	55.62	157.9***	25.07	-258.6*	55.50***	40.47*	-125.4	47.54	-42.16	6.465	28.58	130.4***	15.09	301.2***	297.8***	-38.09	-15.45	66.76**	124.5***
	(21.47)	(24.76)	(34.20)	(32.66)	(62.96)	(31.31)	(19.90)	(96.32)	(13.15)	(16.14)	(76.65)	(46.53)	(45.05)	(8.594)	(39.88)	(19.56)	(35.06)	(26.33)	(28.94)	(30.24)	(21.08)	(20.92)	(18.75)
Observations	7,642	3,771	5,628	3,984	5,181	24,431	4,539	5,435	4,673	4,729	4,423	3,519	3,455	29,415	4,270	4,313	4,424	4,673	5,661	4,328	5,517	4,223	4,101
R-squared	0.636	0.581	0.585	0.684	0.357	0.507	0.388	0.283	0.431	0.480	0.706	0.380	0.283	0.573	0.463	0.423	0.329	0.376	0.510	0.546	0.625	0.351	0.689

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

MATH MODEL 2

VARIABLES	BEL	BGR	CZE	DEU	DNK	ESP	EST	FIN	GRC	HRV	HUN	IRL	ISL	ITA	LTU	LVA	NOR	POL	PRT	SVK	SVN	SWE	TUR
ESCS	3.785***	8.356***	9.979***	3.114**	14.96***	0.493	8.093***	12.32***	9.485***	1.131	1.678	11.52***	13.24***	-0.830	12.01***	10.94***	15.09***	15.40***	9.286***	9.850***	0.0661	19.14***	5.103***
	(0.930)	(1.664)	(1.597)	(1.085)	(1.502)	(1.158)	(1.491)	(1.569)	(1.361)	(1.434)	(1.165)	(1.760)	(1.573)	(0.654)	(1.310)	(1.769)	(1.706)	(1.732)	(1.024)	(1.544)	(1.131)	(1.512)	(0.958)
Average score at school	0.697***	0.795***	0.857***	0.802***	0.752***	0.627***	0.843***	0.845***	0.818***	0.892***	0.855***	0.704***	0.800***	0.900***	0.746***	0.697***	0.776***	0.651***	0.420***	0.809***	0.886***	0.722***	0.862***
	(0.0121)	(0.0216)	(0.00892)	(0.0135)	(0.0212)	(0.0222)	(0.0210)	(0.0276)	(0.0173)	(0.0131)	(0.0104)	(0.0399)	(0.0422)	(0.00752)	(0.0187)	(0.0299)	(0.0292)	(0.0287)	(0.0236)	(0.0176)	(0.0141)	(0.0253)	(0.0118)
female	-28.49***	-9.203***	-17.52***	-23.59***	-17.88***	-27.60***	-15.04***	-10.62**	-24.00***	-21.45***	-24.04***	-10.22***	-5.074	-22.74***	-3.903	-11.33***	-7.536*	-14.13***	-26.90***	-11.36***	-19.19***	-3.459	-27.24***
	(1.744)	(2.234)	(2.314)	(1.776)	(2.426)	(1.721)	(2.945)	(3.044)	(2.421)	(1.961)	(1.949)	(2.389)	(3.015)	(0.943)	(2.813)	(2.473)	(3.134)	(2.437)	(2.040)	(2.511)	(2.365)	(2.550)	(1.417)
grade7	-61.53***	-10.77	-56.72***	-107.1***	-49.08	-96.67***	-119.6***		2.221		-3.152	-77.04***		-11.34	-81.42***	-74.64***		-71.49***	-66.29***	-61.59**		-118.3***	-18.51
	(11.57)	(12.90)	(10.29)	(11.36)	(37.84)	(19.18)	(11.18)		(27.75)		(7.375)	(6.718)		(12.82)	(21.16)	(10.48)		(17.92)	(6.539)	(18.63)		(14.20)	(11.53)
grade8	-58.19***	-19.35*	-34.25***	-66.81***	-41.82***	-89.09***	-71.56***	33.84	45.07**	-5.834	-3.180	-62.21***		1.793	-43.19***	-74.33***		-69.39***	-46.52***	-31.18**	-10.58	-38.75***	2.941
	(6.781)	(9.148)	(6.415)	(4.050)	(7.538)	(5.785)	(7.220)	(16.80)	(13.26)	(4.678)	(3.945)	(12.53)		(4.610)	(5.498)	(5.887)		(12.45)	(5.507)	(9.674)	(11.30)	(9.984)	(4.819)
grade9	-34.12***	-23.02**	-1.737	-36.70***	-14.95*	-44.15***	-41.22***	66.17***	41.08**	-33.74***	-17.29***	-22.89***	-75.86***	-32.60***	-29.72***	-33.75***	-48.86**	-6.547	-6.381	4.293*	-2.845	-8.815*	-22.79***
	(4.074)	(7.304)	(1.334)	(1.914)	(6.906)	(6.100)	(6.975)	(17.14)	(12.27)	(1.903)	(1.763)	(3.091)	(18.97)	(3.189)	(3.488)	(5.062)	(18.31)	(6.343)	(3.431)	(1.733)	(4.736)	(3.582)	(2.534)
grade_above10	46.52***			52.21***		115.0***	150.5***	81.60***			25.82	3.166	15.24	20.39***	79.76***	36.62	8.752		76.83***	25.20***	26.77***		27.15***
	(6.157)			(14.03)		(31.80)	(8.812)	(20.91)			(24.63)	(3.609)	(9.239)	(2.994)	(6.102)	(26.07)	(7.200)		(9.608)	(4.144)	(3.737)		(3.730)
graderep	-21.84***	-24.93***	-34.56***	-10.29***	-38.89***	-21.92***	-32.44***	-55.16***	-40.20**	-36.54***	-11.04***	-28.21***	-62.67***	-4.034	-46.64***	-19.94***		-25.80*	-42.52***	-37.15***	-11.03	-45.72***	-20.85***
	(4.099)	(7.114)	(6.059)	(2.779)	(5.703)	(5.548)	(5.526)	(8.647)	(14.29)	(6.718)	(2.896)	(3.669)	(16.37)	(3.302)	(5.981)	(5.667)		(10.06)	(3.205)	(7.339)	(8.564)	(5.990)	(3.577)
native	7.181**	22.64	12.37**	5.829*	20.42***	7.708**	13.11***	14.63*	4.278	2.994	4.561	11.24*	18.94	13.76***	11.69	12.87**	7.401	-181.5***	7.344*	9.530	12.23**	9.939**	-56.95***
	(2.485)	(16.85)	(4.631)	(2.535)	(3.140)	(2.746)	(3.524)	(5.910)	(3.377)	(2.886)	(5.590)	(5.489)	(9.535)	(2.117)	(6.220)	(4.357)	(4.899)	(10.07)	(3.420)	(11.04)	(3.777)	(3.242)	(10.03)
single_parent	0.744	-7.502*	-7.841***	2.269	4.803	-2.093	-2.717	-10.83***	-0.672	-1.833	0.275	-4.318	-9.204*	3.521*	-3.348	2.520	-0.360	-13.09***	2.631	-6.140*	-5.436	-3.431	-4.508
	(1.941)	(2.953)	(2.140)	(2.192)	(2.886)	(2.070)	(2.352)	(2.853)	(3.604)	(2.753)	(2.143)	(3.627)	(3.664)	(1.363)	(2.371)	(2.263)	(3.128)	(3.159)	(2.539)	(2.789)	(2.913)	(3.881)	(3.104)
mixed_family	-20.54*	-13.12*	-21.16	-6.784	-13.17	-4.456	-19.72***	-26.17*	-37.41***	-37.20**	-8.204	-27.55*	-56.52***	-16.80**	-15.55	-25.16***	-30.61**	-48.27***	-6.695	-29.09***	-35.36***	-32.07***	-26.45***
	(9.693)	(5.260)	(10.69)	(13.69)	(13.91)	(7.047)	(4.627)	(12.22)	(6.482)	(11.87)	(6.753)	(11.93)	(15.30)	(5.599)	(8.285)	(6.599)	(9.277)	(7.430)	(5.189)	(8.467)	(8.295)	(6.602)	(3.565)
books_11_25	13.92***	-0.205	10.16*	2.372	14.53***	20.76***	7.975	16.14*	-1.526	9.107***	18.01***	20.93***	17.55*	2.924	-0.610	-0.979	20.32***	4.775	1.045	15.63***	-2.746	7.613	8.507***
	(3.491)	(5.013)	(4.225)	(3.406)	(3.640)	(3.523)	(5.680)	(5.994)	(3.855)	(2.638)	(4.840)	(3.895)	(7.261)	(1.666)	(2.714)	(4.059)	(5.350)	(3.672)	(3.050)	(4.510)	(3.555)	(5.225)	(2.049)
books_26_100	25.30***	25.58***	21.09***	9.977**	23.83***	36.24***	16.62***	30.07***	11.45**	20.80***	25.15***	37.60***	32.00***	15.24***	20.57***	17.13***	39.89***	24.78***	15.09***	24.68***	12.88***	22.13***	16.93***
	(2.879)	(4.335)	(3.867)	(2.946)	(3.216)	(3.350)	(4.576)	(4.723)	(3.583)	(2.406)	(4.681)	(3.758)	(7.245)	(1.616)	(2.839)	(4.247)	(4.794)	(3.060)	(3.069)	(3.970)	(3.187)	(4.600)	(2.274)
books_101_200	34.95***	34.53***	32.27***	14.16***	33.49***	52.77***	23.83***	43.49***	29.34***	28.35***	37.20***	53.06***	49.17***	19.65***	26.77***	23.88***	59.66***	42.70***	19.44***	34.86***	31.19***	23.36***	22.08***
	(3.719)	(5.670)	(3.724)	(3.311)	(4.195)	(4.427)	(4.540)	(5.422)	(4.421)	(3.967)	(4.593)	(4.203)	(6.841)	(1.790)	(3.429)	(4.596)	(5.276)	(4.322)	(3.481)	(4.150)	(3.999)	(5.239)	(2.809)
books_201_500	36.67***	33.59***	41.37***	30.40***	48.83***	59.71***	32.40***	56.11***	38.95***	34.51***	41.87***	60.46***	70.79***	29.82***	31.54***	37.18***	76.91***	48.39***	35.99***	46.60***	36.29***	57.45***	21.96***
	(3.552)	(5.695)	(4.201)	(3.649)	(4.225)	(4.600)	(5.262)	(4.850)	(5.053)	(4.448)	(5.068)	(4.325)	(7.253)	(1.856)	(4.234)	(4.602)	(5.182)	(5.075)	(3.957)	(4.752)	(4.452)	(5.065)	(3.845)
books_more500	40.82***	36.34***	43.13***	24.82***	42.81***	59.10***	40.87***	63.81***	36.18***	25.63***	52.48***	54.94***	61.50***	27.84***	41.36***	36.08***	77.52***	56.49***	20.90***	50.35***	26.52***	53.57***	20.47***
	(3.928)	(6.417)	(5.048)	(4.160)	(5.502)	(4.257)	(6.038)	(6.617)	(5.701)	(5.295)	(5.264)	(6.633)	(7.576)	(2.371)	(4.203)	(5.768)	(6.259)	(6.238)	(4.886)	(6.386)	(5.625)	(5.742)	(3.655)
stz_games	3.742***	6.058**	3.773**	2.580***	5.584**	5.809***	10.37**	5.371**	7.163***	5.565**	3.619***	4.828**	4.057	5.405***	9.636***	10.27***	7.130**	1.762**	3.799**	7.292***	10.21**	0.903	-0.663
	(1.071)	(1.780)	(1.231)	(0.376)	(1.961)	(1.027)	(3.726)	(1.973)	(1.649)	(1.953)	(0.969)	(1.733)	(9.450)	(0.684)	(2.244)	(2.551)	(2.420)	(0.594)	(1.324)	(1.530)	(3.383)	(1.792)	(0.491)
stz_colcomm	-3.451*	-1.247	-1.977	-0.105	-10.96***	0.0530	-14.04**	-9.221***	-6.652**	2.529	-4.802***	-5.138*	-25.60*	0.975	-2.120	-6.158	-14.42***	-3.302***	2.945	4.315*	-10.06**	-8.405***	1.362
	(1.329)	(3.237)	(1.425)	(0.557)	(2.224)	(1.319)	(4.794)	(2.453)	(2.158)	(2.421)	(1.365)	(2.089)	(11.10)	(0.861)	(2.468)	(3.594)	(3.016)	(0.888)	(1.960)	(1.780)	(3.460)	(1.894)	(0.752)
stz_techinfo	-3.714*	3.926	-2.728	-2.065***	-3.961	-6.862***	-8.484*	-8.446**	-6.385**	1.575	-2.704*	-2.125	-6.057	-8.789***	-12.59***	-17.74***	17.19***	-2.376**	-8.379***	-10.14***	0.569	3.013	-3.447***
	(1.732)	(3.892)	(1.517)	(0.558)	(2.161)	(1.479)	(3.584)	(2.830)	(2.266)	(2.938)	(1.228)	(2.777)	(10.58)	(1.073)	(2.773)	(3.521)	(2.615)	(0.835)	(1.997)	(1.740)	(4.078)	(1.981)	(0.743)
stz_contprob	-6.917***	-16.27***	-5.349***	-1.811***	-8.891***	-7.036***	-19.86***	-4.118	-6.729***	-15.72***	-8.381***	-11.08***	-7.643	-0.0546	-14.47***	-11.64***	-17.84***	-4.309***	-12.54***	-4.015**	-23.14***	-5.127***	-0.698
	(1.275)	(2.351)	(1.280)	(0.375)	(2.400)	(1.376)	(4.860)	(3.415)	(1.432)	(2.142)	(0.970)	(1.795)	(9.132)	(0.659)	(2.146)	(2.626)	(2.132)	(0.747)	(1.740)	(1.513)	(3.601)	(1.403)	(0.541)
stz_games*ESCS	0.951	-3.440*	2.090	-0.472	-0.756	0.838	-0.914	-0.490	-1.332	1.785	2.485*	0.458	7.717	0.198	-1.445	-2.493	-0.392	-0.127	-2.078*	1.004	-3.781	1.251	0.0352
	(1.184)	(1.568)	(1.271)	(0.454)	(1.957)	(0.879)	(4.034)	(2.129)	(1.512)	(2.111)	(1.005)	(1.673)	(7.547)	(0.535)	(2.145)	(2.648)	(2.061)	(0.667)	(1.030)	(1.492)	(3.463)	(1.494)	(0.364)
stz_colcomm*ESCS	-1.257	0.246	0.0699	-0.0854	1.756	1.470	2.026	-3.312	3.704*	-1.270	-0.581	-3.469	6.977	-0.106	-3.138	-2.333	-3.540	-1.587	-1.169	-5.685*	0.550	-1.845	0.217
	(1.684)	(3.366)	(2.035)	(0.494)	(2.470)	(1.273)	(3.954)	(2.416)	(1.768)	(2.700)	(1.182)	(2.732)	(9.440)	(0.934)	(2.409)	(2.989)	(2.282)	(0.950)	(1.454)	(2.284)	(4.790)	(2.132)	(0.484)
stz_techinfo*ESCS	1.931	4.282	-3.956	0.0228	-6.596*	0.122	-7.066	-2.636	-5.297*	-4.278	-1.979	-3.670	-17.22	-2.183*	-4.858	-3.290	-3.821	-0.301	-0.760	-2.759	3.147	-2.800	-0.408
	(1.578)	(3.486)	(2.058)	(0.599)	(2.685)	(1.568)	(4.264)	(2.532)	(2.510)	(3.046)	(1.397)	(2.887)	(9.095)	(0.884)	(2.856)	(3.488)	(2.779)	(1.059)	(1.673)	(2.217)	(5.479)	(2.174)	(0.537)
stz_contprob*ESCS	-1.373	-3.840*	0.975	0.315	-0.803	-2.972*	0.899	-4.538	-0.330	-0.735	-0.562	0.822	-10.17	-0.507	0.695	-0.563	-0.0599	1.274	-1.655	1.457	-5.858	0.131	0.145
	(1.320)	(1.928)	(1.659)	(0.386)	(2.380)	(1.439)	(3.990)	(2.850)	(1.615)	(2.428)	(1.082)	(2.436)	(8.161)	(0.666)	(2.004)	(2.788)	(2.519)	(0.736)	(1.270)	(1.663)	(3.892)	(1.708)	(0.346)
Constant	164.4***	80.81***	49.27***	127.1***	107.8***	176.8***	106.4***	-23.81	80.44***	72.21***	61.55***	123.5***	36.48	37.87***	129.5***	166.2***	52.29***	355.9***	306.7***	70.65***	41.96***	109.7***	139.5***
	(7.379)	(19.14)	(6.895)	(7.378)	(13.85)	(11.78)	(12.82)	(22.67)	(9.009)	(7.112)	(8.426)	(20.80)	(25.67)	(4.072)	(10.86)	(16.46)	(15.22)	(22.34)	(12.82)	(14.56)	(7.543)	(13.89)	(12.11)
Observations	7,772	3,973	5,716	4,109	5,341	24,911	4,591	5,592	4,738	4,801	4,473	3,639	3,501	29,917	4,304	4,374	4,504	4,723	5,688	4,387	5,649	4,331	4,284
R-squared	0.637	0.577	0.582	0.683	0.350	0.507	0.382	0.281	0.425	0.477	0.698	0.377	0.274	0.572	0.462	0.423	0.321	0.375	0.511	0.547	0.623	0.351	0.687

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

READING MODEL 1

VARIABLES	BEL	BGR	CZE	DEU	DNK	ESP	EST	FIN	GRC	HRV	HUN	IRL	ISL	ITA	LTU	LVA	NOR	POL	PRT	SVK	SVN	SWE	TUR
ESCS	-14.08	8.496	-90.31***	-15.96	-2.728	10.80	-8.124	178.4*	2.094	13.14	-63.48	4.400	10.59	-8.261	-22.20	-25.99	3.265	-14.78	24.70	14.90	54.66***	4.928	-13.50
	(31.27)	(16.02)	(23.94)	(39.85)	(36.15)	(6.095)	(20.51)	(68.56)	(7.757)	(13.68)	(45.43)	(34.10)	(22.32)	(5.707)	(28.03)	(21.13)	(23.83)	(12.28)	(18.85)	(24.58)	(14.44)	(26.13)	(9.426)
Average score at school	0.653***	0.714***	0.806***	0.759***	0.660***	0.608***	0.755***	0.785***	0.776***	0.805***	0.818***	0.610***	0.816***	0.844***	0.726***	0.663***	0.721***	0.584***	0.410***	0.774***	0.847***	0.701***	0.788***
	(0.0144)	(0.0243)	(0.0115)	(0.0137)	(0.0250)	(0.0197)	(0.0203)	(0.0264)	(0.0209)	(0.0163)	(0.0133)	(0.0483)	(0.0462)	(0.00786)	(0.0236)	(0.0304)	(0.0252)	(0.0225)	(0.0289)	(0.0180)	(0.0123)	(0.0243)	(0.0177)
female	11.14***	33.25***	23.86***	25.99***	23.45***	17.30***	34.63***	45.47***	28.76***	21.59***	17.07***	18.80***	38.28***	16.66***	46.67***	33.74***	38.89***	37.27***	21.51***	30.31***	17.60***	34.05***	18.06***
	(1.829)	(2.941)	(2.448)	(1.992)	(2.482)	(1.441)	(2.552)	(2.792)	(2.517)	(2.121)	(1.612)	(2.690)	(2.710)	(1.030)	(2.556)	(2.557)	(3.179)	(2.487)	(2.395)	(2.677)	(2.175)	(2.783)	(1.720)
grade7	-65.71***	-13.21	-88.60***	-84.62***	-37.07	-67.82*	-132.1***	-123.7***	-4.610		-25.75**			8.456	-93.13***	-73.90***		-91.35***	-87.43***	-68.88***		-166.9***	-31.87
	(14.93)	(17.79)	(12.80)	(13.25)	(22.60)	(26.62)	(12.73)	(14.56)	(30.42)		(7.816)			(15.05)	(20.45)	(8.754)		(11.70)	(7.521)	(12.20)		(31.14)	(21.29)
grade8	-43.51***	-18.86*	-59.27***	-59.02***	-43.67***	-105.3***	-59.88***	-54.57***	10.18	132.6***	-0.0296	-67.86***		14.98*	-35.54***	-65.59***		-74.87***	-56.00***	-51.09***	-46.67***	-72.42***	-12.56*
	(5.097)	(9.393)	(5.472)	(3.293)	(8.406)	(3.016)	(7.436)	(11.14)	(17.15)	(6.986)	(4.854)	(12.98)		(7.299)	(4.778)	(5.665)		(8.328)	(4.959)	(8.701)	(6.776)	(9.144)	(5.421)
grade9	-27.23***	-15.95	0.461	-30.63***	-11.97	-57.57***	-26.08***	-19.62	26.99**	-30.24***	-20.49***	-10.98	-47.92***	-22.26***	-17.64***	-27.03***	-31.26	0.124	-17.41***	4.536	-1.719	5.191	-25.94***
	(2.735)	(8.078)	(1.582)	(2.027)	(7.936)	(1.585)	(7.513)	(10.47)	(8.782)	(1.806)	(1.911)	(7.993)	(11.97)	(2.042)	(3.427)	(4.940)	(19.50)	(5.709)	(4.218)	(2.656)	(2.670)	(4.828)	(2.394)
grade_above10	41.67***			37.65***		66.89**	121.5***				21.30	-8.072	5.504	13.41***	72.45***	37.20	16.28		57.31***	14.05**	24.42***		22.87***
	(5.906)			(10.43)		(23.31)	(8.854)				(18.83)	(4.494)	(8.287)	(2.588)	(6.086)	(30.47)	(9.104)		(10.26)	(4.474)	(3.394)		(4.083)
graderep	-27.01***	-16.25***			-8.953**				-20.88*	-26.73***	-11.82**	-20.93**		-17.43***		-4.357*			-20.62***	-2.404		-6.825**	
	(3.046)	(4.658)			(2.744)				(8.247)	(5.503)	(3.483)	(7.857)		(2.421)		(2.106)			(3.798)	(2.698)		(2.392)	
native	5.454	43.72**	0.692	7.868**	15.66***	9.047**	14.16***	27.63***	-1.244	5.231	-2.054	7.810	35.09***	19.48***	6.469	8.098	14.75**	-124.9***	8.348*	-24.73**	7.162*	13.62***	-15.63
	(2.877)	(14.53)	(5.700)	(2.359)	(2.969)	(2.963)	(3.318)	(7.123)	(3.638)	(2.682)	(5.567)	(5.574)	(10.05)	(2.307)	(6.716)	(4.568)	(4.723)	(5.354)	(3.439)	(9.057)	(3.525)	(3.334)	(13.56)
single_parent	1.407	-10.19**	0.538	4.933*	0.271	1.278	2.659	-6.484*	-3.914	7.383*	4.133*	-2.682	-5.880	4.157**	-4.557*	-0.577	-0.261	-12.12***	9.838***	1.061	0.154	-4.252	-1.075
	(2.011)	(3.424)	(2.399)	(2.168)	(2.524)	(1.873)	(2.379)	(2.839)	(3.930)	(2.920)	(1.932)	(3.545)	(3.922)	(1.534)	(2.065)	(2.411)	(3.138)	(2.368)	(2.525)	(2.667)	(2.499)	(4.004)	(3.027)
mixed_family	-13.47	-24.93***	-24.77*	2.017	-33.57*	5.373	-21.10***	-34.80*	-39.92***	-28.12*	1.593	-24.24*	-41.27*	-21.03***	-10.77	-24.21***	-53.05***	-48.70***	1.200	-20.48**	-25.54***	-34.62***	-18.43***
	(9.571)	(4.518)	(12.13)	(11.68)	(15.06)	(8.523)	(4.306)	(13.18)	(6.223)	(11.35)	(6.020)	(10.06)	(15.73)	(6.075)	(8.316)	(4.401)	(11.84)	(8.213)	(5.252)	(6.675)	(6.248)	(7.270)	(3.696)
books_11_25	14.08***	14.60**	16.21***	11.71**	12.02**	12.81***	12.47*	25.50***	-4.054	5.780*	6.305	19.76***	1.777	8.248***	7.472**	9.956*	19.42***	7.837*	2.406	12.39**	4.782	12.07*	6.935**
	(3.014)	(5.447)	(4.010)	(3.925)	(3.612)	(3.549)	(5.819)	(6.869)	(4.532)	(2.711)	(4.117)	(3.865)	(8.686)	(1.621)	(2.717)	(4.255)	(5.159)	(3.218)	(3.100)	(4.079)	(2.911)	(4.875)	(2.578)
books_26_100	26.42***	35.77***	27.53***	20.02***	28.64***	28.23***	18.58***	41.15***	9.747*	16.23***	14.48***	41.52***	28.77***	16.24***	20.46***	23.40***	42.65***	28.89***	14.67***	29.86***	16.10***	24.15***	12.21***
	(2.707)	(5.193)	(3.362)	(2.941)	(3.604)	(3.112)	(4.922)	(4.906)	(3.981)	(2.325)	(3.907)	(3.861)	(7.920)	(1.606)	(2.808)	(3.851)	(4.194)	(2.790)	(3.085)	(3.657)	(2.770)	(4.840)	(2.817)
books_101_200	35.18***	41.31***	39.84***	26.64***	42.84***	39.00***	27.35***	55.37***	15.62**	22.44***	21.52***	62.65***	46.69***	20.24***	24.24***	32.43***	57.99***	45.58***	14.12***	40.17***	25.40***	36.18***	21.93***
	(3.171)	(7.027)	(3.891)	(3.063)	(4.413)	(3.219)	(5.128)	(4.907)	(5.048)	(3.272)	(3.917)	(4.168)	(7.515)	(1.698)	(2.956)	(4.519)	(4.403)	(3.499)	(3.151)	(4.354)	(3.469)	(5.198)	(3.479)
books_201_500	38.31***	39.05***	48.54***	38.76***	43.57***	44.45***	34.48***	65.46***	25.77***	23.43***	32.13***	73.54***	65.89***	31.00***	32.25***	44.38***	70.44***	56.57***	27.55***	46.30***	30.11***	58.50***	18.06***
	(3.511)	(6.403)	(4.328)	(3.496)	(4.396)	(4.128)	(5.742)	(5.855)	(5.481)	(4.162)	(4.465)	(4.493)	(8.014)	(1.651)	(3.892)	(4.117)	(4.684)	(4.243)	(3.633)	(5.286)	(4.116)	(5.389)	(4.420)
books_more500	40.22***	35.29***	45.60***	36.61***	39.07***	47.30***	38.40***	65.44***	26.59***	22.41***	38.15***	70.05***	53.58***	26.88***	35.58***	38.53***	71.15***	56.92***	18.63***	46.13***	25.13***	52.82***	16.69**
	(4.559)	(6.703)	(5.073)	(4.282)	(5.658)	(4.055)	(5.841)	(6.508)	(5.917)	(4.814)	(4.654)	(6.858)	(8.489)	(2.041)	(4.347)	(5.878)	(4.880)	(5.621)	(5.162)	(6.506)	(5.060)	(6.350)	(5.333)
totactivities	3.923***	2.704**	8.626***	5.203**	4.312*	2.813***	5.432***	17.72***	3.082***	2.613***	7.863*	6.628**	5.112**	2.617***	6.077***	4.392***	3.154*	4.037***	2.186	4.624***	2.798***	5.215***	2.500**
	(1.099)	(0.857)	(1.955)	(1.635)	(2.030)	(0.384)	(0.691)	(3.669)	(0.619)	(0.726)	(3.262)	(1.962)	(1.739)	(0.312)	(1.124)	(0.716)	(1.239)	(0.929)	(1.098)	(0.919)	(0.618)	(1.038)	(0.815)
tot_activities*ESCS	0.885	0.180	4.584***	0.874	1.425	-0.341	1.197	-7.191*	0.546	-0.127	3.310	0.757	0.173	0.588*	1.998	2.148*	1.040	1.662**	-0.601	0.134	-2.362***	0.791	0.861
	(1.429)	(0.750)	(1.053)	(1.831)	(1.628)	(0.291)	(0.966)	(3.124)	(0.365)	(0.630)	(2.068)	(1.561)	(1.032)	(0.270)	(1.265)	(0.974)	(1.111)	(0.580)	(0.860)	(1.115)	(0.660)	(1.202)	(0.448)
games_int	8.050**	7.592*	4.947	9.732**	8.668*	7.869**	3.560	6.919	12.14**	1.881	8.392**	4.933	-5.504	8.238***	9.229*	9.816**	-0.0584	6.623	7.461	7.704*	5.509	-9.657	-9.387*
	(2.835)	(3.257)	(3.000)	(3.054)	(3.479)	(2.537)	(3.964)	(4.767)	(4.010)	(3.650)	(2.788)	(4.334)	(6.366)	(1.520)	(3.729)	(3.166)	(4.961)	(3.421)	(3.882)	(3.591)	(2.926)	(5.039)	(4.531)
colcomm_int	-12.87*	-17.76*	-10.90	-13.81*	-34.89***	-2.480	-53.35***	-42.15***	-37.17***	-2.288	-17.52**	-22.60*	-43.26**	-1.297	-11.90	-23.11**	-76.48***	-52.24***	18.75*	6.134	-20.85**	-58.85***	1.321
	(5.229)	(7.968)	(6.817)	(6.882)	(7.450)	(4.298)	(9.103)	(9.307)	(7.133)	(6.325)	(5.774)	(8.823)	(15.03)	(3.357)	(6.196)	(8.356)	(13.17)	(8.184)	(7.127)	(6.536)	(6.322)	(11.33)	(8.275)
techinfo_int	-31.98***	2.230	-22.77*	-38.64***	-8.100	-25.25***	-32.82***	-42.94**	-20.83*	-12.80	-26.44***	-52.07***	-13.12	-44.16***	-42.59***	-53.35***	50.39***	-18.99*	-38.20***	-37.48***	-5.310	7.635	-23.51*
	(7.583)	(9.953)	(8.713)	(7.753)	(8.764)	(5.504)	(7.567)	(13.11)	(8.094)	(8.414)	(6.509)	(14.04)	(16.28)	(4.383)	(9.180)	(8.602)	(11.38)	(8.677)	(6.607)	(7.582)	(7.210)	(13.92)	(10.29)
contprob_int	-42.53***	-40.05***	-23.27***	-21.51***	-40.25***	-34.27***	-47.05***	-20.91	-33.33***	-41.02***	-37.30***	-29.94**	-11.23	-5.055*	-38.17***	-50.13***	-52.58***	-43.12***	-52.67***	-24.32***	-34.09***	-27.21**	-16.73**
	(5.837)	(6.917)	(5.511)	(5.755)	(6.998)	(5.019)	(9.045)	(10.76)	(6.288)	(5.649)	(4.658)	(8.856)	(10.60)	(2.360)	(6.124)	(6.833)	(7.841)	(8.037)	(5.081)	(6.007)	(5.006)	(9.498)	(6.108)
games_int*ESCS	8.627**	-3.753	2.537	-1.808	-1.465	4.009	1.207	0.323	-4.198	5.536	1.031	3.566	9.877	0.527	-4.385	-0.316	0.205	2.570	-0.624	-3.199	-5.442	8.163*	-4.294
	(2.859)	(3.309)	(3.470)	(3.754)	(2.902)	(2.109)	(3.571)	(4.477)	(3.438)	(3.739)	(2.841)	(4.493)	(5.133)	(1.619)	(3.335)	(4.125)	(4.255)	(3.457)	(2.646)	(3.142)	(2.922)	(3.684)	(2.549)
colcomm_int*ESCS	-9.238	-5.370	-9.026	-15.10*	-5.337	-1.285	-6.045	-2.794	4.678	-4.142	-4.385	-10.93	29.03*	0.762	-8.248	-25.22**	-12.65	-17.40	-4.529	-17.41*	4.264	1.103	4.902
	(6.922)	(8.407)	(10.13)	(6.918)	(8.407)	(4.568)	(7.716)	(9.037)	(7.475)	(7.196)	(5.425)	(9.682)	(12.04)	(3.583)	(7.665)	(8.419)	(9.847)	(9.153)	(5.309)	(8.500)	(6.927)	(12.86)	(5.167)
techinfo_int*ESCS	2.006	4.011	-4.420	14.66	-28.58**	-0.514	-11.57	-11.33	-8.614	-20.20*	-11.08	-29.60*	-41.49**	-12.25**	-16.60	-1.897	-5.037	-9.022	-4.379	-12.96	-2.673	-18.81	0.0945
	(7.352)	(11.76)	(10.58)	(8.624)	(9.544)	(5.283)	(7.905)	(11.11)	(10.65)	(8.562)	(6.439)	(12.52)	(14.63)	(3.684)	(8.594)	(9.899)	(10.35)	(10.50)	(5.846)	(9.263)	(8.362)	(16.22)	(6.634)
contprob_int*ESCS	-11.60*	-4.424	11.81	2.223	10.61	-9.340*	2.619	-9.162	-1.026	3.668	-2.446	5.873	-14.45	-0.290	1.564	2.013	-7.527	16.34*	2.157	11.86	-0.235	-11.12	-4.094
	(5.258)	(5.263)	(7.024)	(6.138)	(7.006)	(4.506)	(7.447)	(14.51)	(5.572)	(5.985)	(4.538)	(11.75)	(8.646)	(2.730)	(5.133)	(7.150)	(8.733)	(7.272)	(4.588)	(6.536)	(4.586)	(12.26)	(4.490)
Constant	95.64***	22.04	-116.8**	6.023	64.67	122.3***	27.31	-319.1***	44.18**	48.32**	-74.12	40.84	-92.20	-4.067	-8.014	87.05***	6.957	237.1***	251.3***	4.148	-3.295	-1.159	72.09**
	(26.82)	(28.09)	(43.47)	(34.84)	(44.72)	(12.75)	(19.45)	(84.93)	(16.31)	(18.26)	(71.90)	(48.23)	(47.48)	(8.516)	(27.09)	(21.93)	(34.08)	(24.28)	(27.68)	(26.89)	(15.28)	(27.85)	(23.50)
Observations	7,642	3,771	5,628	3,984	5,181	24,431	4,539	5,435	4,673	4,729	4,423	3,519	3,455	29,415	4,270	4,313	4,424	4,673	5,661	4,328	5,517	4,223	4,101
R-squared	0.597	0.591	0.562	0.654	0.370	0.509	0.445	0.342	0.497	0.529	0.718	0.407	0.282	0.614	0.507	0.472	0.357	0.425	0.501	0.573	0.678	0.380	0.593

READING MODEL 2

VARIABLES	BEL	BGR	CZE	DEU	DNK	ESP	EST	FIN	GRC	HRV	HUN	IRL	ISL	ITA	LTU	LVA	NOR	POL	PRT	SVK	SVN	SWE	TUR
ESCS	3.954***	7.919***	7.643***	2.249*	15.68***	1.770*	10.08***	15.26***	9.968***	4.141**	3.142*	11.54***	12.05***	0.818	9.56	9.899***	15.49***	15.73***	8.020***	6.849***	0.834	17.55***	4.272***
	(0.948)	(1.809)	(2.000)	(1.107)	(1.510)	(0.824)	(1.362)	(1.679)	(1.212)	(1.296)	(1.248)	(1.973)	(1.599)	(0.579)	-1.322	(1.848)	(1.652)	(1.704)	(0.937)	(1.359)	(1.299)	(1.830)	(1.067)
Average score at school	0.668***	0.726***	0.820***	0.776***	0.673***	0.628***	0.765***	0.804***	0.792***	0.819***	0.825***	0.658***	0.827***	0.855***	0.733***	0.676***	0.726***	0.595***	0.411***	0.781***	0.855***	0.712***	0.796***
	(0.0150)	(0.0233)	(0.0116)	(0.0138)	(0.0245)	(0.0199)	(0.0197)	(0.0221)	(0.0190)	(0.0164)	(0.0126)	(0.0485)	(0.0471)	(0.00748)	(0.0223)	(0.0303)	(0.0251)	(0.0227)	(0.0290)	(0.0183)	(0.0121)	(0.0257)	(0.0173)
female	11.98***	35.23***	24.60***	27.25***	24.40***	18.06***	36.24***	47.17***	30.82***	23.77***	17.87***	20.85***	40.63***	17.71***	47.95***	35.74***	41.62***	39.96***	21.79***	30.97***	18.24***	37.84***	18.10***
	(1.876)	(2.915)	(2.494)	(1.973)	(2.539)	(1.476)	(2.595)	(2.355)	(2.679)	(1.977)	(1.664)	(2.783)	(2.887)	(1.015)	(2.592)	(2.733)	(3.156)	(2.517)	(2.403)	(2.656)	(2.134)	(2.897)	(1.766)
grade7	-85.94***	-14.00	-88.64***	-85.65***	-53.46	-98.25**	-132.5***	-127.4***	4.616		-25.51**			12.75	-94.19***	-75.82***		-90.33***	-87.60***	-76.40***		-167.7***	-35.94
	(13.90)	(16.03)	(12.51)	(12.98)	(26.97)	(29.21)	(12.37)	(20.31)	(28.90)		(7.989)			(12.54)	(21.00)	(8.738)		(11.73)	(7.559)	(12.95)		(23.85)	(19.47)
grade8	-45.08***	-16.71	-60.34***	-59.71***	-45.11***	-106.8***	-62.43***	-56.83***	10.48	138.3***	-0.0605	-72.79***		16.00*	-36.02***	-68.88***		-75.93***	-57.12***	-50.94***	-44.00***	-73.39***	-15.69
	(5.243)	(8.684)	(5.626)	(3.204)	(8.316)	(2.697)	(7.443)	(13.66)	(16.59)	(7.094)	(4.797)	(12.38)		(6.538)	(4.878)	(6.059)		(8.426)	(4.965)	(8.845)	(6.778)	(8.157)	(7.898)
grade9	-27.76***	-15.40*	0.872	-31.30***	-11.05	-57.84***	-26.53***	-20.03	27.89**	-30.25***	-21.12***	-12.67	-49.23***	-22.79***	-18.23***	-27.72***	-28.95	0.332	-18.24***	4.855	-0.296	3.394	-27.22***
	(2.791)	(7.608)	(1.484)	(1.974)	(7.881)	(1.592)	(7.477)	(13.29)	(8.186)	(1.804)	(1.893)	(7.618)	(11.04)	(1.925)	(3.453)	(5.016)	(19.95)	(5.923)	(4.198)	(2.707)	(2.522)	(3.715)	(2.347)
grade_above10	42.40***			37.27***		67.51**	128.6***				23.12	-5.679	2.738	13.72***	70.59***	38.31	16.54		57.05***	14.54**	25.30***		21.52***
	(5.913)			(10.68)		(23.02)	(8.759)				(18.88)	(4.363)	(8.162)	(2.548)	(5.946)	(30.93)	(9.301)		(10.31)	(4.471)	(3.392)		(3.804)
graderep	-27.45***	-16.88***			-8.725**				-22.57**	-27.13***	-11.82**	-18.24*		-17.91***		-4.333*			-20.01***	-2.662		-6.073**	
	(3.181)	(4.918)			(2.637)				(7.898)	(5.596)	(3.546)	(7.397)		(2.336)		(2.159)			(3.747)	(2.785)		(2.297)	
native	6.414*	40.71**	0.497	8.048**	17.17***	9.842**	16.82***	28.75***	0.341	5.421	-3.061	14.55*	36.48***	20.23***	6.151	9.043	18.38***	-126.7***	7.922*	-24.06**	7.534*	14.92***	-15.70
	(2.904)	(14.08)	(5.662)	(2.426)	(2.831)	(3.003)	(3.293)	(7.567)	(3.511)	(2.723)	(5.606)	(5.598)	(9.645)	(2.321)	(6.711)	(4.603)	(5.146)	(5.411)	(3.542)	(8.935)	(3.502)	(3.117)	(13.43)
single_parent	1.943	-10.29**	0.141	6.018**	-0.410	1.304	1.864	-6.940*	-4.525	7.057*	4.635*	-3.024	-6.320	4.259**	-4.540*	0.199	-0.958	-13.31***	9.955***	0.671	0.0515	-5.301	-1.688
	(1.971)	(3.466)	(2.448)	(2.164)	(2.456)	(1.677)	(2.364)	(2.827)	(3.797)	(3.053)	(1.981)	(3.568)	(3.867)	(1.567)	(2.040)	(2.421)	(3.286)	(2.414)	(2.520)	(2.643)	(2.471)	(4.114)	(2.913)
mixed_family	-13.58	-24.35***	-22.97*	2.979	-33.08*	3.309	-21.47***	-39.05***	-41.65***	-27.48*	0.944	-25.83*	-37.19*	-23.41***	-9.607	-25.99***	-53.52***	-54.88***	0.850	-19.74**	-25.47***	-35.41***	-21.19***
	(9.346)	(4.455)	(11.38)	(11.65)	(14.42)	(8.224)	(4.240)	(10.55)	(5.803)	(11.01)	(6.103)	(10.58)	(15.37)	(5.909)	(8.394)	(5.661)	(11.36)	(9.375)	(5.351)	(6.332)	(6.205)	(6.995)	(4.829)
books_11_25	14.19***	14.43*	15.07***	11.38**	11.88**	14.36***	13.62*	23.96***	-5.159	6.722*	7.049	20.88***	1.511	7.577***	8.006**	10.70*	17.28**	6.696*	2.288	11.50**	5.368	12.29**	6.644*
	(2.949)	(5.574)	(4.005)	(3.923)	(3.513)	(3.639)	(5.874)	(5.961)	(4.606)	(2.702)	(4.229)	(4.054)	(8.597)	(1.584)	(2.750)	(4.280)	(5.259)	(3.257)	(3.102)	(4.194)	(2.844)	(4.651)	(2.712)
books_26_100	26.56***	34.33***	26.84***	20.48***	28.33***	29.74***	19.51***	39.94***	8.820*	17.82***	14.32***	42.12***	28.67***	15.93***	21.05***	23.68***	40.94***	28.33***	14.35***	29.07***	16.73***	23.45***	12.07***
	(2.648)	(5.012)	(3.434)	(3.010)	(3.424)	(2.972)	(4.932)	(4.643)	(4.003)	(2.334)	(4.186)	(3.757)	(7.866)	(1.567)	(2.776)	(3.928)	(4.293)	(2.718)	(3.069)	(3.680)	(2.784)	(4.593)	(2.718)
books_101_200	35.32***	40.79***	39.23***	26.82***	42.66***	39.86***	28.55***	55.37***	15.15**	23.50***	21.47***	62.20***	46.63***	19.76***	24.54***	32.09***	57.26***	45.09***	13.86***	38.32***	25.91***	36.18***	21.41***
	(3.176)	(6.937)	(3.854)	(3.245)	(4.428)	(3.295)	(5.095)	(5.031)	(4.947)	(3.328)	(4.099)	(4.122)	(7.522)	(1.714)	(2.979)	(4.541)	(4.483)	(3.462)	(3.145)	(4.274)	(3.415)	(5.082)	(3.474)
books_201_500	38.61***	38.53***	48.10***	38.94***	43.78***	46.37***	36.55***	64.43***	25.45***	23.46***	32.14***	74.40***	65.29***	30.37***	32.72***	45.23***	69.13***	56.32***	27.45***	44.52***	30.55***	59.86***	17.83***
	(3.375)	(6.184)	(4.271)	(3.711)	(4.252)	(3.998)	(5.767)	(5.609)	(5.285)	(4.490)	(4.696)	(4.600)	(8.206)	(1.625)	(3.796)	(4.106)	(4.866)	(4.253)	(3.643)	(5.174)	(4.061)	(5.214)	(4.348)
books_more500	39.92***	34.65***	42.25***	35.62***	38.89***	48.05***	39.79***	64.74***	25.12***	22.49***	38.13***	68.10***	51.22***	26.08***	35.93***	39.67***	70.69***	55.25***	18.61***	42.55***	25.97***	51.23***	16.54**
	(4.416)	(6.598)	(5.095)	(4.358)	(5.278)	(3.852)	(6.038)	(6.188)	(5.956)	(4.844)	(4.799)	(6.929)	(8.383)	(2.111)	(4.100)	(5.988)	(5.176)	(5.625)	(5.123)	(6.770)	(5.001)	(6.092)	(5.437)
stz_games	4.641***	6.546***	2.935*	1.676***	6.201**	3.854***	7.761	4.936*	6.551***	3.265	3.585***	4.920**	-3.274	4.215***	6.115**	9.882***	1.684	1.801**	3.136*	4.190*	6.757*	-1.354	-1.124
	(1.306)	(1.704)	(1.178)	(0.410)	(2.009)	(1.035)	(3.921)	(2.255)	(1.604)	(1.977)	(0.907)	(1.863)	(10.03)	(0.605)	(2.181)	(2.648)	(2.480)	(0.595)	(1.570)	(1.601)	(2.898)	(1.810)	(0.589)
stz_colcomm	-1.880	-4.176	-1.529	-0.753	-8.818***	0.347	-22.52***	-8.478***	-11.14***	-0.523	-3.173*	-4.198	-26.36*	-0.266	-3.102	-6.246	-16.18***	-4.432***	5.041**	2.211	-10.10**	-9.102***	0.450
	(1.222)	(2.884)	(1.520)	(0.496)	(2.179)	(1.097)	(4.656)	(2.020)	(2.136)	(2.372)	(1.205)	(2.384)	(11.23)	(0.827)	(1.948)	(3.504)	(3.158)	(0.767)	(1.811)	(1.698)	(3.561)	(1.953)	(0.773)
stz_techinfo	-5.304**	5.420	-4.355*	-1.857***	2.112	-3.721**	-8.087*	-5.141	-3.141	-1.773	-4.059***	-6.415*	-1.690	-8.139***	-11.43***	-17.68***	16.76***	-1.304	-9.121***	-8.280***	0.284	5.868**	-1.756
	(1.678)	(3.522)	(1.907)	(0.522)	(2.219)	(1.212)	(3.644)	(3.034)	(2.073)	(2.733)	(1.167)	(3.034)	(11.42)	(0.949)	(2.717)	(3.346)	(2.979)	(0.780)	(1.631)	(1.794)	(3.740)	(2.089)	(0.897)
stz_contprob	-9.508***	-17.72***	-5.888***	-1.551***	-12.55***	-9.090***	-27.18***	-5.338*	-8.854***	-14.39***	-8.106***	-8.285***	-9.386	-0.933	-13.32***	-20.92***	-16.31***	-4.016***	-15.51***	-6.203***	-23.65***	-6.417***	-1.576**
	(1.310)	(2.757)	(1.352)	(0.413)	(2.242)	(1.363)	(4.992)	(2.328)	(1.795)	(1.970)	(1.049)	(2.078)	(8.631)	(0.622)	(2.108)	(2.624)	(2.345)	(0.753)	(1.481)	(1.398)	(3.170)	(1.690)	(0.547)
stz_games*ESCS	3.551**	-1.907	1.051	-0.341	-1.060	1.565	0.0956	-0.227	-2.013	2.284	0.497	0.895	17.29*	-0.0737	-2.281	0.814	0.392	0.283	-0.378	-1.909	-5.470	3.003*	-0.451
	(1.252)	(1.588)	(1.337)	(0.519)	(1.674)	(0.848)	(3.612)	(1.846)	(1.372)	(2.019)	(0.962)	(1.898)	(7.987)	(0.635)	(1.888)	(3.031)	(2.116)	(0.604)	(1.067)	(1.393)	(2.906)	(1.431)	(0.359)
stz_colcomm*ESCS	-2.141	-1.609	-1.781	-1.072*	-0.807	-0.103	-2.476	-1.719	1.559	-1.076	-0.480	-2.868	23.19*	0.432	-2.948	-6.956	-3.470	-1.296	-1.336	-4.735*	1.413	-0.438	0.575
	(1.662)	(3.144)	(2.228)	(0.511)	(2.388)	(1.083)	(3.796)	(2.364)	(2.239)	(2.591)	(1.123)	(2.684)	(9.408)	(0.872)	(2.421)	(3.588)	(2.249)	(0.819)	(1.407)	(2.202)	(3.920)	(2.189)	(0.508)
stz_techinfo*ESCS	0.237	2.832	-0.235	1.110	-8.226**	0.245	-2.647	-3.610	-2.265	-6.134*	-1.940	-6.468*	-25.34*	-3.132***	-4.976*	-0.0684	-0.992	-0.957	-0.812	-3.131	-0.915	-4.831*	0.0395
	(1.712)	(3.843)	(2.233)	(0.578)	(2.427)	(1.217)	(3.778)	(2.232)	(2.732)	(2.807)	(1.152)	(2.721)	(10.57)	(0.801)	(2.481)	(3.931)	(2.731)	(0.940)	(1.436)	(2.217)	(4.286)	(2.287)	(0.549)
stz_contprob*ESCS	-2.851*	-3.024	2.485	0.0603	2.468	-2.958*	0.910	-1.787	-0.761	0.415	-0.708	0.721	-14.75*	-0.398	0.628	-0.503	-2.534	1.277	0.416	2.695	-0.216	-1.104	-0.532
	(1.208)	(2.203)	(1.649)	(0.438)	(2.295)	(1.141)	(4.062)	(3.104)	(1.583)	(2.135)	(0.959)	(2.710)	(7.009)	(0.705)	(1.778)	(2.939)	(2.609)	(0.676)	(1.369)	(1.511)	(3.013)	(2.040)	(0.392)
Constant	154.4***	61.90**	48.95***	95.00***	123.2***	157.4***	96.40***	30.20	79.80***	85.67***	77.34***	129.0***	-13.79	33.84***	100.1***	145.0***	47.63**	294.6***	285.6***	89.36***	38.73***	78.37***	109.3***
	(9.312)	(19.16)	(9.255)	(6.979)	(14.87)	(11.17)	(11.99)	(20.28)	(9.840)	(8.662)	(9.648)	(24.71)	(26.35)	(4.360)	(12.56)	(16.90)	(13.99)	(16.65)	(15.43)	(13.69)	(6.476)	(14.04)	(16.40)
Observations	7,772	3,973	5,716	4,109	5,341	24,911	4,591	5,592	4,738	4,801	4,473	3,639	3,501	29,917	4,304	4,374	4,504	4,723	5,688	4,387	5,649	4,331	4,284
R-squared	0.599	0.589	0.557	0.650	0.358	0.508	0.438	0.340	0.488	0.525	0.712	0.405	0.272	0.615	0.505	0.462	0.352	0.423	0.500	0.572	0.676	0.374	0.592