Unraveling a secret: Vietnam's outstanding performance on the PISA test 2012

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Abstract: This paper seeks to find an empirical explanation of Vietnam's outstanding performance on the PISA assessment in 2012. Sets of possible explanatory variables are explored, pertaining to students, parents, teachers, and the schools they attended. The methods used include a comparison of mean values and two kinds of regression estimates comparing the data for Vietnam with a set of 7 developing countries, whose average performance lags Vietnam's by more than 100 points. The 'Vietnam effect' is difficult to unscramble, and the best estimate extends to only 50% of the gap between Vietnam and the 7 countries. The analysis reveals that Vietnamese students may be approaching their studies with higher diligence and discipline, their parents may have higher expectations, and the parents may be following up with teachers regarding those expectations. The teachers themselves may be working in a more disciplined environment, with tabs being kept on their own performance as teachers. Vietnam may also be benefiting from investments in pre-school education and in school infrastructure that are disproportionately higher when compared to Vietnam's per capita income level.

Keywords: PISA;Vietnam;Oaxaca-Blinder Decomposition; Fryer-Levitt; Economics of Education.

JEL Classification Numbers: I21 (Analysis of Education); I28(Government Policy); Z18(Public Policy).

*E-mail for corresponding author: *sparandekar@worldbank.org* This paper has been written using open source software: R for the econometric analysis and graphics and LaTeX for typesetting. Thanks to all who make free software possible and to OECD for making the PISA data freely and easily available to anyone. The code used in writing this paper is freely available for download at http://github.com/zagamog/PISA_PAPER

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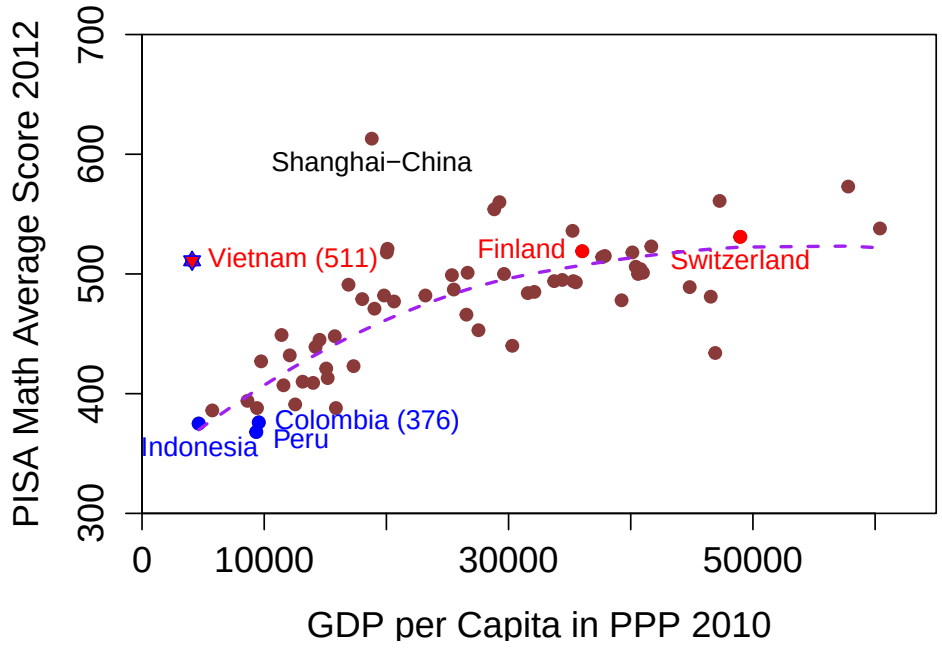
1 Introduction

Vietnam participated in PISA for the first time in 2012 and its performance has been much higher than other developing countries that take part in this OECD led initiative. PISA scores of 15 year-olds in Mathematics, Reading and Science are calibrated to an OECD mean of 500 and standard deviation of 100 points. Only a few developing countries take part in PISA, perhaps because most of them have results much lower than the OECD countries. Figure 1 indicates a positive, albeit non-linear correlation between GDP per capita and PISA test scores. The figure shows that Vietnam's performance in PISA (mathematics mean score of 511) is closer to that of Finland and Switzerland rather than of Peru and Colombia. Vietnam, represented by a red star in Figure 1, lies much above the cluster of developing countries in the lower left hand corner of Figure 1.

Figure 1: PISA 2012 results compared with GDP per capita

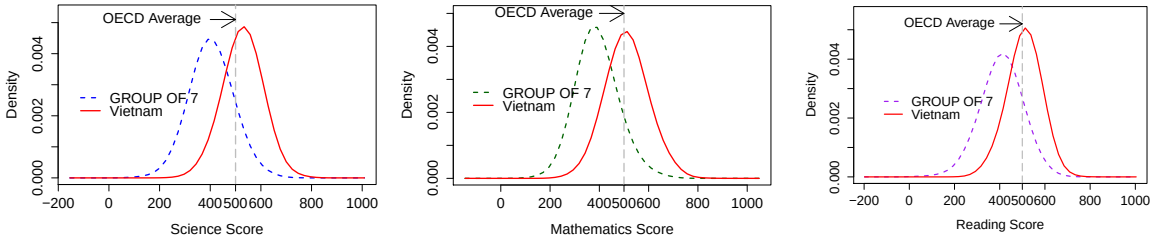


Source: OECD-PISA database

In the OECD-PISA database, there are seven countries other than Vietnam with a per capita GDP (in PPP dollars) below US$ 10,000 - Albania, Colombia, Indonesia, Jordan, Peru, Thailand and Tunisia. Their collective weighted average performance in mathematics has a mean score of 383. It is helpful to understand the significance of this 128 point difference with Vietnam. According to a recent OECD publication [OECD, 2013a], *"an entire proficiency level in mathematics spans about 70 score points –a large difference in the skills and knowledge students at that level possess. Such a gap represents the equivalent of*

about two years of schooling in the typical OECD country." Applying this heuristic would imply a nearly 3 year difference in educational attainment between Vietnam and the group of 7 developing countries in the PISA database. It should be noted at the outset that cross-section data from one application of PISA does not permit causal inference, but correlations can still provide useful insights. The difference is not only for mathematics and not just in the mean score, but spanning the entire test distribution, as can be seen in Figure 2.

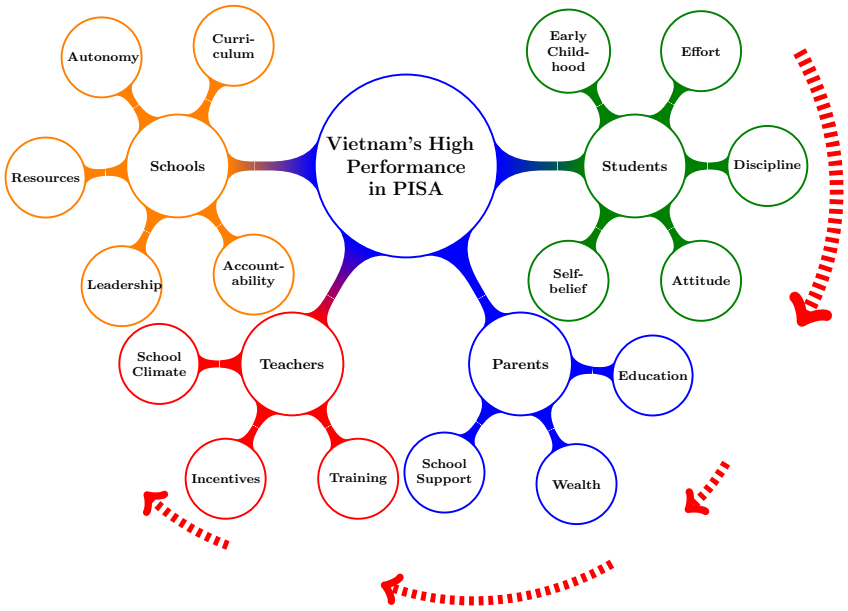
Figure 2: Kernel Density comparison between Vietnam and other Developing Countries



(a) Science **(b)** Mathematics **(c)** Reading

A range of alternative classifications are possible to organize the explanatory factors available in the OECD-PISA database. Figure 3 presents four sets of factors, starting clockwise from the right. This is admittedly an arbitrary classification, utilized merely for expository purposes as we consider each of the constituent variables in turn.

Figure 3: Conceptual Scheme based on available comparative variables



The approach of this paper is as follows. We begin in Section 2 by examining closely the differences in endowments between Vietnam and the collective group of 7 developing countries, termed as Dev7 for this paper (not to be confused with the G-7 of wealthy countries). The word 'endowments' is used in a general sense, referring not merely to wealth related variables such as school resources, but to the range of policy, attitudinal and reported prac-

tices in the PISA dataset. The variables can also be considered as exogenous variables for the purpose of this analysis. In this first section we examine the mean differences in the levels of these variables. Comparing means in this context is a first pass at understanding the performance anomaly of Vietnam on empirical grounds. Without any priors, we want to look at seemingly obvious possible explanation - that Vietnamese 15 year olds somehow enjoy better endowments - economic, social, cultural and so on. This first pass can be quite revealing. For instance, even though we know that Vietnam's GDP per capita is the lowest in this group of countries, perhaps the Vietnamese government and people have invested heavily in basic education, and schools in Vietnam enjoy a higher quality of facilities and equipment. Or the teachers have much higher levels of education, and so on. Alternatively, one could find empirically that the schools are worse equipped and teachers poorly trained. An examination of mean differences will provide us with a first set of tentative hypotheses.

We take a second, closer approach in Section 3 by adopting the regression methodology used by Fryer and Levitt in understanding differences in test score results of black children in the United States [Fryer and Levitt, 2004]. Differences in mean values of endowments leave some questions unanswered, which further analytical approaches can seek to resolve. In a multi-variate setting, we can try to understand how much of the variation can be explained by differences in observable endowments, and how much can be attributed to effects other than the observable differences. Fryer and Levitt have quite successfully followed this approach to explain what they see as evidence of a systemic difference in schools attended by black children. We adopt a similar approach to find out how much of the 'Vietnam gap' could reasonably be attributed to the earlier differences in mean endowments. As a matter of fact, we show in this section that the large differences in mean endowments is important, but it explains at best only half of the test score differences.

The Fryer and Levitt method deepens the understanding from mean comparisons, but what it does not reveal may be as interesting as what it does in fact reveal. Our Fryer-Levitt adaption is based on a pooled regression of eight developing countries, where we follow the fate of the magnitude of the coefficient of the dummy variable representing the Vietnamese student in the sample. However, we also need to investigate structural differences in the effects of endowments between Vietnam and Dev7 countries. In Section 4, we adopt an approach first used to explain variation in PISA performance between Germany and Finland by Andreas Ammermueller [Ammermueller, 2007]. This is an adaptation of the popular Oaxaca-Blinder decomposition of wage earnings equation to uncover evidence of discrimination on the basis of gender [Blinder, 1973] and [Oaxaca, 1973]. In this section, we examine closely the structural differences between Vietnam and the Dev7 countries, including

the contribution of differences in endowments and the coefficients to the gap in test scores.

Even a multi-variate regression approach only proves correlation with nothing more than a hint regarding causation, and so far we have only one year (2012) of PISA data for Vietnam. PISA 2015 data will be available in 2016 and analytical approaches closer to establishing causality can be attempted. Even though we cannot uncover causality, there are useful policy related conclusions that we can derive from the analysis presented in this paper. There is a veritable industry of papers regarding Finland's PISA performance, directed mostly toward other OECD countries with lower scores, for instance the United States. Vietnam's superlative performance points to a similar future stream of research, with the added advantage of relevance for developing countries. Section 5 provides concluding ideas that might be amongst the first of many more such ideas for future investigations of Vietnam's performance.

2 Endowment Differences

2.1 Student Characteristics

Table 1 begins an exploration of differences in mean values between Vietnamese and Dev7 students. This exploration only provides us with a beginning in our task of unraveling the mystery of Vietnam's performance. Neither mean differences nor the regressions that follow can claim to uncover causality. However, they do provide circumstantial evidence. Table 1 presents student characteristics, and it should be noted that the absence of differences is sometimes as important as the presence of differences. Table 1 indicates no differences by age or gender of student. The PRESCHOOL variable shows the first instance of a statistically significant difference. While 78.88% of Dev7 students reported attending pre-school, the number of students attending pre-school from the Vietnam sample was 91.20% - a sizable difference both statistically and economically significant. The relationship between pre-school and later outcomes has been studied very closely over the years. Longitudinal impact evaluation studies regarding the Perry Pre-school project and Head Start in the US are amongst the most cited studies in the economics literature[1]. We can also see from the numbers of REPEAT in Table 1 that PISA takers in Vietnam were three times less likely to have repeated a grade in the past (6.79% compared to 19.15%).

[1]For detailed meta-analysis, see [Barnett, 1995] and [Schweinhart et al, 2005]

Table 1: Student characteristics and family background

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
Fixed characteristics					
FEMALE	Sex of student	0.5265 (0.4993)	41394	0.5336 (0.4989)	4882
AGE	Age of student	15.8211 (0.2895)	41394	15.7692 (0.2885)	4853
Student's prior history					
PRESCHOOL	Attended Preschool	0.7888 (0.4082)	40114	0.912 (0.2833)	4866
REPEAT	Grade repeating	0.1915 (0.3935)	40343	0.0679 (0.2516)	4860
Truancy from School					
ST08Q01	Times late for school	1.5131 (0.7648)	40663	1.1872 (0.4685)	4873
ST09Q01	Days unexcused absence	1.2192 (0.5276)	40650	1.0999 (0.3527)	4875
ST115Q01	Times skipped classes	1.2585 (0.545)	40632	1.0764 (0.3216)	4880
Parental background and family wealth					
HISEI	Highest parental occupational status	40.4196 (22.5168)	32814	26.6023 (19.855)	4860
MISCED	Educational level of mother (ISCED)	3.1193 (1.9853)	40486	2.1744 (1.6059)	4844
WEALTH	Family wealth possessions	-1.4606 (1.2267)	40821	-2.1343 (1.1656)	4881
CULTPOS	Cultural possessions	-0.1424 (0.9678)	39905	-0.2361 (1.0173)	4809
HEDRES	Home educational resources	-0.7427 (1.1473)	40579	-1.0743 (0.9364)	4874
BOOK_N	Number of books in family home	53.6393 (94.5556)	39631	50.786 (75.4031)	4841

Notes: The variables relate to the questionnaires administered to students in the general (non-rotated) booklet. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix.The variable means of Dev7 and Vietnam are statistically different at the 95% significance level, except FEMALE.

This finding regarding PRESCHOOL and REPEAT indicates the possible importance of the trajectory of the student prior to High School. Repetition rates are difficult as comparative indicators of system quality because of the variations across countries in curriculum and standards, but REPEAT is another interesting variable to keep in mind as a possible clue to the mystery of Vietnam's PISA performance. As in some other East Asian cultures, Vietnamese children are expected to study hard by their parents. Though Mark Twain, translated into Vietnamese is quite a best seller for young readers in Vietnam, truancy from school is not perceived benevolently by parents.[2] Table 1 indicates a consistently lower tru-

[2]A cultural explanation is possibly quite important in explaining Vietnam's anomalous PISA results, though the PISA dataset may only be able to measure the possible effects of culture rather than measuring cultural differences. Literature from the World Values Survey, that does seek to measure cultural differences, indicates that Vietnam is a positive outlier on discipline and authority orientation[Dalton and Ong, 2005].

ancy rate for the three variables used. The question refers to the past two complete weeks of school and we can see that Vietnamese students are less likely to have been late for school, have fewer days of unexcused absence and skip fewer classes.[3]

The final set of variables in Table 1 concern parental background and wealth at the students home, including cultural resources and books at home which may work to stimulate cognitive development. The PISA database includes a number of indices to measure aspects such as wealth. These indices are based on underlying data regarding occupations and possessions. The scaling of raw data to indices is described in detail in the PISA technical report [OECD, 2014a]. For HISEI, the parental occupation status, the OECD mean is 50 and the OECD standard deviation is 15. Table 1 shows that HISEI for Dev7 parents stands at 40.42 and is thus much higher than 26.60, for Vietnamese parents. MISCED refers to the International Standard Classification of Education (ISCED) developed by UNESCO. Table 1 shows that the average level of mother's education (ISCED) for Dev7 was just over 3, meaning Upper Secondary education, while for Vietnam the mean was just over 2, meaning Lower Secondary education. The WEALTH index is set for an OECD mean of zero and standard deviation of 1. Dev 7 countries wealth level was -1.5 and Vietnam's was -2.1, consistent with the data regarding occupational classification and mother's education. These findings indicate the close correlation of these variables with GDP per capita. The more interesting finding concerns the indices CULTPOS and HEDRES, which have an OECD mean 0 and a standard deviation 1, as well as BOOK_N, the number of books. CULTPOS includes classical literature, books of poetry and works of art. HEDRES includes reference books and books to help with school work as well as a study desk and 'a quiet place to study'. These three variables are also in line with per capita income - with the Dev7 mean being lower than the OECD mean, and Vietnam being lower than the Dev7 mean. One explanation regarding Vietnam's PISA performance can probably be ruled out - it does not seem likely that Vietnamese households spend a disproportionately higher amount of their income on acquiring possessions such as books and other objects that would give their children an edge in life.

[3]In the student's questionnaire, there is a telling question - student's have to agree or disagree on a four point Likert scale to the statement "If I had different teachers, I would try harder at school.". Converted into an index, the mean for Vietnam at 0.363 is lower than that for Dev7 at 0.525. This suggests a tendency in Vietnamese students for greater self-responsibility.

2.2 Student Effort

The phenomenon of primary and high school children taking extra classes to supplement in school instruction in Vietnam is well known, see [Ha and Harpham, 2005] and [Dang, 2007]. Table 2 indicates that while Dev7 students spent roughly 4.7 hours in such classes (total of OUTMATH, OUTLANG and OUTSCIE), the Vietnamese student spends nearly 2 hours more for a total of 6.6 hours per week, with the difference being highest for OUTMATH. Vietnamese students also spent about 1 additional hour per week doing homework (total of ST57Q01 and ST57Q02) compared to Dev7 students. The highest difference in this set of variables concerns the variable ST57Q04, which relates to extra classes taught by a commercial company. While most of the schools in Vietnam are public or government schools, it is interesting to note that students report nearly 5 hours of commercially provided extra lessons, while the total for Dev7 countries is only about 2 hours per week. Collectively, these variables indicate that Vietnamese students spent about 16 hours per week studying outside of school, compared to 13 hours per week for Dev7 students.

Table 2: Student studying time out of school

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
Weekly out-of-school hours per subject					
OUTMATH *(r)*	weekly out-of-school lessons in math	1.828 (2.1539)	23603	3.1305 (2.3133)	3227
OUTREAD *(r)*	weekly out-of-school lessons in 'test language'	1.2882 (1.9623)	23531	1.4483 (1.8837)	3223
OUTSCIE *(r)*	weekly out-of-school lessons in science	1.5609 (2.0456)	23298	2.0927 (2.1776)	3205
Weekly out-of-school hours approach					
ST57Q01 *(r)*	Out-of-school time homework	5.0953 (5.0319)	23696	5.8145 (5.7196)	3164
ST57Q02 *(r)*	Out-of-school time guided homework	2.551 (2.9296)	19355	2.8814 (3.2384)	2285
ST57Q03 *(r)*	Out-of-school time personal tutor	1.7276 (2.7884)	20367	1.5749 (2.938)	3049
ST57Q04 *(r)*	Out-of-school time classes by company	1.892 (3.3487)	19517	4.878 (4.8058)	3091
ST57Q05 *(r)*	Out-of-school time parent/family member	2.1354 (3.055)	21542	1.7646 (3.2442)	3092
ST57Q06 *(r)*	Out-of-school time learn on computer	2.588 (3.5519)	21338	1.8029 (3.0496)	3079

Notes: The variables relate to the questionnaires administered to students in the rotated booklet, marked with *(r)*. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix. The variable means of Dev7 and Vietnam are statistically different at the 95% significance level.

2.3 Student Attitudes

PISA applications in each round have a focus on one of the subjects and in PISA 2012 the focus subject was mathematics. Mathematics happens to be the subject where the mean score difference is highest between Vietnam and Dev7 countries. The PISA questionnaire for students includes a very interesting series of questions regarding students' perceptions of their abilities, their effort and their reported practices. The details of these questions can be found in the PISA technical report [OECD, 2014a]. Typically, each question includes a set of Likert scaled items to which the student provides a discrete response on a four point agree-disagree scale. These responses are then combined under specified algorithms to provide an index value. For instance, MATWKETH, is meant to measure a student's 'mathematics work ethic'. Students either agree or disagree with a set of 9 items on a 4 point likert scale - strongly disagree, disagree, agree and strongly disagree. The items include items such as "I work hard on my mathematics homework", and "I listen in mathematics class", "I keep my mathematics work well organized". In the case of this example, when a student agrees/strongly agrees with a positive statement, or disagrees/strongly disagrees with a negative statement, he or she would tend to be deemed to have a stronger work ethic towards mathematics. The raw data from the Likert scale is converted into an index using IRT scaling procedures, so that the mean for OECD countries is 0 and the standard deviation is 1. Table 3 indicates a most interesting finding regarding a range of such indices from the PISA database.

Table 3: Student self-perception regarding mathematical ability and student effort

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
Indices susceptible to 'bragging' tag					
MATWKETH *(r)*	Mathematics work ethic	0.4514 (0.9782)	26140	-0.0014 (0.6915)	3217
SUBNORM *(r)*	Subjective norms in mathematics	0.716 (1.165)	26509	-0.0923 (0.8395)	3220
OPENPS *(r)*	Openness to problem solving	0.1949 (0.9787)	25612	-0.6125 (0.8708)	3207
SCMAT *(r)*	Self-concept of own math skills	0.1673 (0.8101)	26222	-0.1896 (0.5903)	3249
Indices less related to being modest/boastful					
PERSEV *(r)*	Perseverance in problem solving	0.3387 (0.9605)	25710	0.4475 (0.8767)	3211
ANXMAT *(r)*	Mathematics Anxiety	0.3995 (0.7724)	26275	0.2115 (0.6354)	3248
MATINTFC *(r)*	Mathematics intentions	0.092 (0.9837)	24827	0.3285 (1.0964)	3181

Notes: The variables relate to the questionnaires administered to students in the rotated booklet, marked with *(r)*. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix. The variable means of Dev7 and Vietnam are statistically different at the 95% significance level.

The upper panel in Table 3 indicates a set of indices for which the scores of Vietnamese students are lower than the scores of Dev7 students. For example, the score for MATWKETH is 0.45 for Dev7 and 0 for Vietnam. The variable SUBNORM is supposed to measure subjective norms regarding mathematics. This construct relates to a student's perceptions regarding how other people in the student's life value mathematics. It includes items such as "my friends enjoy taking mathematics tests" and "my parents believe it's important for me to study mathematics." Presumably, when this measure is high, the student has a high subjective norm for mathematics. Table 3 shows that the resulting mean for Dev7 countries is 0.72 and the corresponding value for Vietnam is -0.09. The index SCMAT includes items such as "I learn mathematics quickly" and "I have always believed that mathematics is one of my best subjects". Vietnamese students, who scored more than 1 standard deviation above the Dev7 students on the PISA math test, scored half a standard deviation lower on SCMAT. What is going on here?

This mini-mystery within the overall mystery can possibly be resolved by looking at some further indices. The lower panel of Table 3 reports on indices where the balance tips to the other side - these are indices where Vietnamese students performed better than Dev7 students. These three indices bear close examination. PERSEV consists of items that purport to capture perseverance with a task or a problem to resolve; ANXMAT is a negative index (less is better) that deals with mathematics anxiety (for example, an item included in this index is "I get very nervous doing mathematics problems"); MATINTFC relates to future mathematics intention, including items such as "I am planning on majoring in a subject in college that requires lots of mathematics".

One possible explanation, as indicated in the heading of the Table 3 panels, is that Vietnamese students are brought up in a culture that stresses the importance of modesty and humility as a pathway to learning. They may find it difficult to say great things about themselves, because of cultural norms against bragging or boasting. The lower panel in Table 3, on the other hand includes items that are less prone for an immodest interpretation. To say that you are not afraid of mathematics may not be perceived as bragging. In this context, the Vietnamese students are less anxious and more confident about the future of mathematics in their life.[4]

[4]It will be straightforward to examine this hypothesis more closely by performing an IRT scaling of the underlying items for the indices. We can then test for differences between Vietnam and the Dev7 countries in values of the location parameters linking the items to the index. Systematic differences will tend to support the hypothesis laid out here.

2.4 Mathematics Curriculum

In addition to beliefs and perceptions of students regarding mathematics in general, PISA also seeks to closely investigate the issue of content of mathematics instructions. PISA incorporates a very interesting approach to avoid or minimize the bragging or over-claiming problem referred to in the previous sub-section. The index FAMCON is constructed out of a response to a question about mathematical concepts for which students are asked "How familiar are you with the following items?" The list of items includes items such as 'Linear Equation', 'Quadratic Function' and 'Cosine.' The list of items also includes three nonsensical items or pseudo-concepts that sound fancy: 'Proper Number','Subjunctive Scaling' and Declarative Fraction'. These items are termed as FOIL, and are used as trick items to calibrate the response for over-claiming on part of the students. The index without correction is presented as FAMCON, and the index with correction is presented as FAMCONC. It is quite fascinating that with FAMCON, the "uncorrected" version, Dev7 students come out apparently better than Vietnam students, with a mean value of 0.26 as compared to 0.12. Unfortunately, it appears that this also included familiarity with non-existent items like 'subjunctive scaling' - or bragging. With the corrected version, FAMCONC, the Vietnamese students turn out to do much better, with a mean value of 0.43 as compared -0.54 for Dev7.

Table 4: Student reported experience in mathematics

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
FAMCON *(r)*	Familiarity with math concepts	0.2559 (1.1654)	26164	0.1225 (0.6935)	3243
FAMCONC *(r)*	FAMCON corrected with FOIL	-0.5441 (0.8768)	25832	0.4297 (0.9057)	3231
EXAPPLM *(r)*	Experience with applied math tasks	0.1111 (1.06)	26133	-0.2418 (0.7624)	3243
EXPUREM *(r)*	Experience with pure math tasks	-0.1384 (0.9809)	25973	0.1587 (0.8076)	3244

Notes: The variables relate to the questionnaires administered to students in the rotated booklet, marked with *(r)*. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix. The variable means of Dev7 and Vietnam are statistically different at the 95% significance level.

The index EXAPPLM asks students about their experience during school work with examples of applied mathematics problems. Similarly, the index EXPUREM refers to experience with examples of pure mathematics. Not surprisingly, Vietnamese students indicate a lower performance on EXAPPLM and a higher performance on EXPUREM.[5]

[5]It has been a long standing issue that Vietnamese students are expected to learn a curriculum that is more crammed than the international norm, but contains more theory and abstract mathematics rather than applied mathematics. See [Danh Nam Nguyen and Trung Tran, 2013] and [Tuan Anh Le, 2007].

2.5 Parental Support at School

The publication of the bestselling book [Chua, 2011] "Battle Hymn of the Tiger Mother" in 2011 ignited a firestorm of controversy. The book gave prominence in the popular culture to a vast academic literature regarding parenting styles and the perceived higher performance of children from Asian immigrant families in the US and other Western countries. One of the ways that parents influence children's educational outcome is through the interaction that parents have with their child's teachers and others at school. The PISA data includes a question that tries to examine parental expectations. This question (SC24) includes a statement "There is *constant pressure* from many parents, who expect our school to set very high academic standards and to have our students achieve them."[6] Table 4 indicates a higher level of PARPRESSURE (an index derived from SC24Q) for Vietnam, compared to Dev7. Another question (SC25) asks school principals about the proportion of parents that take part in a set of 12 activities. While the question does not specify which parent (or both) may be involved, the variables have been named after the mother for ease of exposition.

Table 5: Parental Support at School

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
PARPRESSURE	Parental achievement pressure	0.2665 (0.4421)	40372	0.3837 (0.4863)	4866
TIGERMOM	Parent initiates - progress discussion	52.4472 (38.097)	41394	62.4183 (41.3743)	4882
DUTYMOM	Teacher initiates - progress discussion	66.9737 (36.727)	41394	68.5543 (37.4796)	4882
VOLUMOM	Parent Participation - Volunteering	35.2134 (38.8428)	41394	38.3623 (39.9773)	4882
TEACHMOM	Parent Participation - Teaching Assistance	12.1764 (23.4241)	41394	38.2821 (41.5357)	4882
FUNDMOM	Parent Participation - Fundraising	23.0784 (35.2134)	41394	59.6022 (44.0376)	4882
COUNCILMOM	Parent Participation - School government	36.4546 (37.2252)	41394	23.1174 (36.4406)	4882

Notes: The variables relate to the questionnaires administered to schools. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix. The variable means of Dev7 and Vietnam are statistically different at the 95% significance level.

TIGERMOM refers to the reported proportion of parents who discussed their child's behavior or the child's progress "on their own initiative", to differentiate from cases where parents might have done so on the initiative of the teacher, termed as DUTYMOM. Table 4 shows a slightly higher number on DUTYMOM for Vietnamese parents compared to

[6] [Hsin and Xie, 2014] investigate in great detail data from a set of longitudinal surveys that cover thousands of children over a long period of time starting from their early childhood through High school. As part of the explanation of the superior performance of Asian immigrant children, the authors report that "Asian students report greater parental expectations of academic success."

Dev7, but a greater difference, more than ten percentage points for TIGERMOM. VOLUMOM refers to parents volunteering in various non-academic activities, such as field trips or carpentry and yard work. Vietnamese parents appear to have a slight advantage with regard to VOLUMOM, yet a much higher advantage when considering TEACHMOM, which refers to parents volunteering as assistants to the teacher - 38.28% compared to 12.18% for Dev7. Vietnamese parents also appear to be much more active in fund raising, looking at FUNDMOM, though they may have less formal influence through school committees.

2.6 Teacher Characteristics

Conventional measures regarding student-teacher ratios and teacher certification show some advantage for Vietnam over Dev7 as shown in Table 6.

Table 6: Teacher characteristics and management

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
Teacher numbers and teacher management					
PROPCERT	Proportion of certified teacher	0.6757 (0.4042)	35130	0.7961 (0.3978)	4586
SMRATIO	Mathematics teacher-student ratio	188.1791 (158.6256)	33985	120.9773 (43.6092)	4777
SC35Q02	Professional development in math in last 3 months	40.5068 (40.8546)	39550	49.0086 (45.1706)	4762
STUDREL *(r)*	Teacher student relations	0.3794 (1.0178)	25870	0.0186 (0.8883)	3253
TCH_INCENTV	Teacher appraisal linked to incentives	-0.0317 (1.0301)	41394	0.2687 (0.6336)	4882
Quality assurance of mathematics teachers through ...					
TCH_MENT	Teacher mentoring as quality assurance	0.8566 (0.3505)	40734	0.9859 (0.1181)	4882
TCM_PEER	Teacher peer review of lectures, methods etc	0.7916 (0.4061)	41095	0.8382 (0.3683)	4882
TCM_OBSER	Principal or senior staff observations	0.8015 (0.3989)	41170	0.9785 (0.1451)	4882
TCM_INSPE	Observation of classes external inspector	0.5882 (0.4922)	41020	0.8664 (0.3402)	4882

Notes: The variables relate to the questionnaires administered to schools and students in the rotated booklet, marked with *(r)*. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix. The variable means of Dev7 and Vietnam are statistically different at the 95% significance level.

The student-teacher ratio overall is not much different for Vietnam and Dev7 and stands at roughly 20 students per teacher. However, there are more specialized mathematics teachers in Vietnam, as shown by the values for SMRATIO (121 in Vietnam compared to 188 for Dev7). There is a higher percentage of certified teachers in Vietnam, and higher reported professional development in mathematics (SC35Q02). A very interesting variable from a

policy point of view regards incentives for teachers. School principals were questioned to what extent performance appraisal or other forms of feedback are related to incentives for teachers in seven different forms, from salary and bonus to public recognition and greater job responsibilities. The answers were to be given on a 4 point scale: 'No change', 'A small change', 'A moderate change' and 'A large change'. We converted the rating into a Rasch index, scaled to an OECD mean of 0 and standard deviation of 1. The mean for Dev7 for this index, TCH_INCENTV was -0.03 for Dev7 and 0.27 for Vietnam, indicating greater presence of teacher incentives in Vietnam. The final set of variables in Table 6 deal with the way that quality assurance regarding teacher performance is carried out, with help of a mentor, peer, supervisor and external inspector. These variables indicate a higher prevalence of oversight for teachers in Vietnam, with the difference being greatest for external inspections (86.64% in Vietnam compared to 58.82% in Dev7 countries).

2.7 Pedagogical Practices

Pedagogical practices are an outcome of a complex interaction between curriculum and related educational policies, economic possibilities and the cultural and historical context. It is difficult to trace differences in these practices in a quantitative survey.[7] Table 7 presents a few variables that seek to capture variation in pedagogical practices. They indicate the higher prevalence of national policies in Vietnam regarding the use of computers in the classroom and the use of a standardized curriculum that specifies what has to be taught each month. There is no difference with regard to the use of a single textbook. There is some difference in the use of formative student assessment, with slightly higher percentage of use of assessments to monitor teachers and schools in Vietnam. COGACT represents an OECD-PISA index variable based on response to student reports regarding classroom practices such as teachers requiring students to reflect on a problem or develop new procedures rather than common practices. This variable shows a much lower level of cognitive activation in Vietnam (-0.33) compared to 0.30 for Dev7. In the final set of classroom management variables, an interesting variation can be seen in DISCLIMA, an index variable that measures disciplinary climate in class, and is higher for Vietnam (0.38) than Dev7 (-0.02).

[7]For an interesting recent qualitative study that seeks to emulate the TIMSS video study for Vietnam, see [Vu Dinh Phuong, 2014].

Table 7: Pedagogical practices

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
Policies applied					
COMP_USE	Math policy - use of computers in class	0.4345 (0.4957)	40800	0.6447 (0.4787)	4815
TXT_BOOK	Math policy - same textbook	0.7905 (0.4069)	40557	0.7855 (0.4105)	4882
STD_CUR	Maths policy - standardized curriculum	0.8705 (0.3358)	40595	0.949 (0.22)	4882
Fromative assessment used to ...					
ASS_SCH	monitor the schools yearly progress	0.9111 (0.2846)	40555	0.9799 (0.1403)	4882
ASS_TCH	make judgements on teachers' effectiveness	0.7764 (0.4166)	40400	0.9912 (0.0934)	4882
Cognitive Activation in Mathematics					
COGACT *(r)*	Cognitive activation in mathematics lessons	0.2998 (0.975)	26217	-0.3278 (0.6647)	3249
Classroom Management					
STU_FEEDB	Seeking written feedback from students	0.7105 (0.4536)	40788	0.8419 (0.3649)	4882
CLSMAN *(r)*	Teacher classroom management (in math)	0.2394 (0.905)	25753	0.2163 (0.7761)	3252
DISCLIMA *(r)*	Disciplinary climate in class (in math)	-0.0243 (0.9055)	26242	0.3747 (0.6926)	3254

Notes: The variables relate to the questionnaires administered to schools and students in the rotated booklet, marked with *(r)*. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix.The variable means of Dev7 and Vietnam are statistically different at the 95% significance level, except TXT_BOOK.

2.8 School Characteristics

Table 8 indicates interesting basic differences between Vietnam and Dev7 school characteristics. Vietnamese schools are about half as likely to be private schools (8% compared to 17%) and less dependent on funding from student fees (in Vietnam, student fees account for 17% of the school's financing, compared to 26% on average for Dev7. One very useful comparison comes from a question regarding the geographic location of the high school. The percentage of schools reported in a VILLAGE (defined in PISA by population below 3,000 inhabitants), was 46% of High schools in Vietnam compared to 14% of High schools in Dev7 countries. With CITY, defined by a population above 100,000 inhabitants, we find only 23% Vietnamese schools in cities, compared to 41% of High schools located in cities for Dev7 countries.

Table 8: School characteristics

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
PRIVATESCL	Private school dummy variable	0.1714 (0.3768)	41182	0.0832 (0.2762)	4882
SC02Q02	Funding for school from student fees	25.7233 (36.0117)	34621	16.6104 (26.3564)	4848
VILLAGE	School located in a village	0.1403 (0.3473)	41347	0.4584 (0.4983)	4882
TOWN	School located in a town	0.4508 (0.4976)	41347	0.3101 (0.4626)	4882
CITY	School located in a city	0.4089 (0.4916)	41347	0.2315 (0.4218)	4882
CLSIZE	Average class size	35.013 (9.764)	40771	42.5043 (8.7236)	4882
SCHSIZE	Number of enrolled students at school	1057.0332 (924.2422)	35062	1302.9009 (648.6821)	4882
PCGIRLS	Proportion of girls at school	0.4900 (0.2597)	36342	0.5282 (0.0801)	4882

Notes: The variables relate to the questionnaires administered to schools. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix.The variable means of Dev7 and Vietnam are statistically different at the 95% significance level.

The average class size in Vietnam is higher, with 43 students compared to 35 students in Dev7 countries, and the schools in Vietnam are bigger, with average enrollment of 1,303 students compared to 1,057 in Dev7. There is also a slightly higher percentage of girls in Vietnamese schools.

2.9 School Resources

The comparison of Vietnam and Dev7 regarding school resources may be showing that Vietnam makes a deeper effective investment in education (Table 9). Schools in Vietnam have a lower number of computers per student (0.22) compared to a value of 0.39 for Dev7. However, the ratio of computers connected to the Internet is slightly higher in Vietnam (78% compared to 76%). Indices on quality of school educational resources (SCMATEDU) show Vietnam with -0.4941 value and Dev7 with -0.8145 value, and similar higher Vietnam level exists for quality of physical infrastructure at the school (SCMATBUI). There is also a higher proportion of schools that offer additional math classes. These differences indicate that Vietnam has made it a priority to invest in Basic Education that compensates to some extent for its income disadvantage compared to the Dev7. With regard to extra-curricular activities, there is a mixed picture. Not all extra-curricular activities are shown in Table 9, but some indicate lower prevalence in Vietnam compared to Dev7 - for instance school band and math club (not shown, with similar pattern are chess club, IT club, art club). Some activities have higher prevalence in Vietnam - school play/musical, mathematics competition, and sports (not shown here). It would appear that even for extra-curricular activities, the

prevalence of more serious activities or activities that require greater effort or competition are more prevalent in Vietnam compared to Dev7.

Table 9: School resources and Management

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
Resource quantity and quality					
RATCMP15	Available computers for 15-year-olds	0.3909 (0.5476)	39490	0.2216 (0.3411)	4875
COMPWEB	Ratio of computers connected to Internet	0.7556 (0.3578)	37446	0.7795 (0.3109)	3634
SCMATEDU	Quality of school educational resources	-0.8145 (1.1538)	41373	-0.4941 (0.9718)	4882
SCMATBUI	Quality of physical infrastructure	-0.6322 (1.1113)	41221	-0.3988 (1.0161)	4882
SCL_EXTR_CL	School offers additional math classes	0.6538 (0.4757)	40869	0.9584 (0.1997)	4882
Extra-curriculars					
EXC1_BAND	School offers Band, orchestra or choir	0.4710 (0.4992)	40044	0.1678 (0.3737)	4882
EXC2_PLAY	School offers school play/musical	0.5928 (0.4913)	40122	0.8509 (0.3562)	4882
EXC5_MCLUB	School offers mathematics club	0.453 (0.4978)	40154	0.2687 (0.4434)	4882
EXC6_MATHCOMP	School offers Mathematics competition	0.6268 (0.4837)	40215	0.8032 (0.3977)	4882
EXC10_SPORT	School offers sporting activities	0.9321 (0.2516)	40581	0.992 (0.089)	4882
Leadership accountability and autonomy					
SCORE_PUBLIC	Achievement data posted publicly	0.345 (0.4754)	40965	0.7567 (0.4291)	4882
SCORE_AUTHRITS	Achievement data tracked by authority	0.8003 (0.3998)	41139	0.8282 (0.3773)	4778
SCHAUTON	School Autonomy in admin. decisions	-0.2542 (1.1328)	41394	-1.0419 (0.9378)	4882
TCHPARTI	Teacher participation in admin. decisions	-0.2169 (1.4457)	41394	-1.6445 (0.5188)	4882
LEADCOM	Communicating and acting on defined school goals	0.2387 (1.1105)	41252	0.0894 (0.6744)	4882
STUDCLIM	Student-related aspects of school climate	0.0485 (1.1642)	40973	0.0418 (0.6849)	4874
TEACCLIM	Teacher-related aspects of school climate	-0.1997 (1.1474)	40973	-0.0873 (0.7125)	4874

Notes: The variables relate to the questionnaires administered to schools. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix.The variable means of Dev7 and Vietnam are statistically different at the 95% significance level, except STUDCLIM.

With regard to school leadership and autonomy, there appears to be less autonomy and more accountability in Vietnam. The index variable SCHAUTON indicates a Dev7 mean value of -0.2542, higher than the Vietnam mean value of -1.0419 (recall that indices are set to OECD mean of zero). Teachers in Vietnam have lower chances to participate in school management - TCHPARTI indicates a Dev7 mean value of -0.2169 compared to 1.6445 for Vietnam. Principals in Dev7 are more likely to say that they communicate and

act on information (LEADCOM), but there is much higher prevalence of public posting of school achievement data (SCORE_PUBLIC) in Vietnam. Interestingly, even Dev7 countries have high levels of achievement tracking data by authorities (80% of schools report this - SCORE_AUTHRITS). Finally, with regard to the school climate, indices described further in the PISA documentation, STUDCLIM (student climate) is roughly even between Vietnam and Dev7, but TEACCLIM (teacher climate), that incluses variables such as teacher absenteeism and teacher expectations of students, is higher for Vietnam.

2.10 Preliminary conclusions from comparison of endowments

In summary, the mean comparisons between Vietnam and Dev7 students finds a number of potentially insightful results. Consider the four-fold classification of factors presented in the conceptual diagram of Figure 3 - students, parents, teachers and the school.

Students: Students in Vietnam are more likely to have attended Pre-school, and less likely to have repeated grades in the past. They are likely to have been more disciplined at school, skip fewer classes, and assume greater responsibility for their own learning. Vietnamese students are less likely to brag about their abilities and experience and yet work harder, especially out of school, in extra classes. They tend to have lower anxiety about mathematics and higher confidence about the usefulness of mathematics in their future.

Parents: Parents in Vietnam are likely to be more involved in the school life of their children than parents of students in Dev7 countries. Though time spent on homework help is similar in both groups, Vietnamese parents are more likely to volunteer at school, take part in fund-raising for the school, and help the teachers as classroom assistants. Vietnamese parents are also more likely to seek to meet the teacher to discuss their child's progress or the child's behavior on their own initiative. Principals in Vietnam report higher levels of parental pressure.

Teachers: Teachers have similar levels of formal education in both groups, but Vietnamese teachers may have had more recent professional development activities. There are more specialist mathematics teachers at high schools in Vietnam, and teachers overall are also more likely to be certified. The performance of teachers is more likely to be monitored in Vietnam, with higher emphasis on student achievement and on making information about that achievement public. Teachers also tend to have lower autonomy, more likely to be subject to centralized policies and work in an environment with higher prevalence of incentives for performance. Principals report fewer problems with regard to teacher absenteeism, which squares with an explanation about a Confucian heritage culture.

Schools: Vietnam has a much lower level of economic development compared to the Dev7 countries, which is reflected in lower levels of educational attainment of parents and lower level of home possessions, including so called cultural possessions such as artwork and books. Also, comparatively more Vietnamese students go to school in villages and small towns, reflecting the national population distribution. Yet, two things are striking about schools - although schools have fewer computers compared to Dev7 countries, these computers are as likely as Dev7 countries to be connected to the internet. Also, indices regarding quality of school infrastructure and school educational resources are less deficient in Vietnam compared to Dev7, which is indicative of substantive investments in schools in the past few decades.

Overall, across these four domains of information, it seems likely that the PISA dataset is able to detect significant cultural differences between Vietnam and Dev7 countries. There appears to be some influence of policy, looking at student achievement assessment and teacher incentives, and higher levels of centralized controls, but the effectiveness of such policies is also likely tied to cultural factors. Unlike the 'World Values Survey' the set of PISA instruments is not suited to clearly identify cultural differences, for instance through responses regarding beliefs, attitudes and practices defined specifically to discriminate between cultures. While mean differences provide interesting hints, they are essentially bi-variate correlations. In order to tell us more about the correlations, which ones are more important than others, and whether indeed some unobservable 'Vietnamese culture' variable may be a plausible explanation, we need to unravel the mystery further through a study of multi-variate correlations. We do this first by using the Fryer-Levitt approach.

3 Regression Approach I: Fryer-Levitt

We are now ready to investigate the secret a bit further by deepening our analytical approach beyond a mere comparison of means. We adopt a simple methodology that is easy to understand and interpret. Our approach closely follows [Fryer and Levitt, 2004] who sought to explain the achievement gap for Black children in the US. For the results presented in this section, we pool the student level data from Vietnam and Dev7 countries. Recall that Dev7 stands for the seven developing countries in the 2012 PISA dataset with a per capita income below the cut-off of US$10,000. The reason for focusing on developing countries is that we want to have a common support with regard to a country's wealth. If a rich country shows outstanding results, perhaps it may be of interest to other rich countries which do not do as well, but it is hardly of great interest to a poor country. But if a poor country does

very well, and stands out from the pack of poor countries that mostly do poorly in PISA, readers from poor countries want to know what can explain such a phenomenon, since it clearly cannot be attributed to the wealth of the country (as captured albeit imperfectly by per capita GDP). We start by looking at Mathematics, with the identical approach being used for the other two PISA disciplines; Reading and Science.

3.1 Mathematics

We estimate a weighted least squares regression of student level test scores as follows:[8]

$$TESTSCORE_i = VIETNAM_i'\gamma + X_i'\Theta + \epsilon_i \tag{1}$$

A key estimate of interest is γ, the coefficient on $VIETNAM$, a 0 or 1 dummy variable. Regressions are run in a sequence, starting from one without any covariates in X, and then adding variables in groups to expand X in consecutive columns in Table 10. Column (1) in Table 10 shows that the Vietnam dummy had a coefficient of 128.05, when no other covariates are added. By construction, this is the absolute difference in means between Vietnam and the Dev7 countries. Next, we want to see the extent to which observable variables included in the PISA dataset can help to explain this large gap of 128.05.[9] The first set of variables included in the regression reported in column (2) concern the students themselves. The student characteristics were - if they went to Pre-School, repeated a grade in the past, and how often they are late for school (ST08Q01) or skipped classes(ST115Q01). With these variables included, the coefficient on the dummy or "the Vietnamese advantage" or "gap", comes down by nearly 20 points, or roughly 0.2 standard deviation units, to 108.91. In other words, one key reason that the Vietnam gap is so high is because of these student related variables - this result was hinted at in the endowment comparison presented earlier in Section 2. Note that of the four student variables used in column (2), only two are statistically significant. The method used for the variable selection depicted in Table 10 was a trial and error method depending on whether or not, within each group of variables (students, parents etc.) the inclusion of the variable leads to a reduction of the coefficient on the Vietnam dummy. We retain the variable if it leads to a reduction in the Vietnam

[8]This is a simplification, used to present our main idea. In PISA, the test score is not provided as a single value but as a set of five plausible values for each student, and complex algorithms have to be used for weighting based on a method called Balanced Repeated Replication (BRR) using Fay's variant. Details are provided in the PISA technical manual [OECD, 2014a]. In this paper, we utilize the R *intsvy* package for implementation.

[9]For variables not discussed in the previous sections, please see Appnedix Table A1 for a mean value comparison table.

dummy coefficient, even if the variable itself may or may not be statistically significant.

Table 10: The estimated impact of 'Vietnam' on Mathematics PISA test scores

	Mathematics									
Variables	(1)		(2)		(3)		(4)		(5)	
VIETNAM	128.05	(5.65)	108.91	(5.32)	97.46	(5.48)	95.13	(5.87)	77.26	(7.84)
PRESCHOOL	-	-	45.86	(3.92)	40.54	(3.95)	39.21	(4.09)	24.90	(3.80)
REPEAT	-	-	-50.57	(2.59)	-47.55	(2.56)	-45.05	(3.19)	-36.96	(3.00)
ST08Q01	-	-	-8.59	(1.20)	-8.41	(1.18)	-8.38	(1.33)	-7.84	(1.32)
ST115Q01	-	-	-4.94	(1.70)	-4.57	(1.73)	-6.10	(1.80)	-5.40	(1.86)
BOOK_N	-	-	-	-	0.09	(0.01)	0.08	(0.01)	0.07	(0.01)
PARPRESSURE	-	-	-	-	10.73	(5.01)	12.51	(4.78)	10.02	(4.40)
FUNDMOM	-	-	-	-	0.27	(0.06)	0.24	(0.06)	0.19	(0.07)
COUNCILMOM	-	-	-	-	-0.14	(0.06)	-0.18	(0.06)	-0.10	(0.07)
DUTYMOM	-	-	-	-	-0.07	(0.06)	-0.12	(0.07)	-0.10	(0.07)
PROPCERT	-	-	-	-	-	-	16.08	(5.50)	16.32	(6.87)
SMRATIO	-	-	-	-	-	-	-0.01	(0.01)	-0.03	(0.01)
TCSHORT	-	-	-	-	-	-	-1.91	(1.97)	2.24	(1.87)
TCFOCST	-	-	-	-	-	-	0.30	(2.19)	-1.45	(1.88)
TCM_STUASS	-	-	-	-	-	-	10.85	(7.45)	-0.18	(7.85)
TCM_PEER	-	-	-	-	-	-	-1.53	(6.59)	-5.61	(5.65)
TCH_INCENTV	-	-	-	-	-	-	-0.92	(2.73)	-2.75	(2.72)
ASS_PROG	-	-	-	-	-	-	-0.51	(15.51)	-22.58	(8.04)
ASS_PROM	-	-	-	-	-	-	7.60	(6.11)	14.09	(5.80)
ASS_SCH	-	-	-	-	-	-	5.51	(6.51)	0.51	(7.31)
STU_FEEDB	-	-	-	-	-	-	3.66	(5.27)	2.20	(5.07)
PCGIRLS	-	-	-	-	-	-	-	-	14.59	(13.65)
COMP_USE	-	-	-	-	-	-	-	-	-1.57	(5.30)
TXT_BOOK	-	-	-	-	-	-	-	-	-9.51	(7.05)
TOWN	-	-	-	-	-	-	-	-	-9.53	(3.76)
CLSIZE	-	-	-	-	-	-	-	-	0.81	(0.23)
COMPWEB	-	-	-	-	-	-	-	-	15.28	(6.31)
SCMATEDU	-	-	-	-	-	-	-	-	5.58	(2.94)
SCMATBUI	-	-	-	-	-	-	-	-	3.46	(2.45)
EXC2_PLAY	-	-	-	-	-	-	-	-	8.69	(3.96)
EXC6_MATHCOMP	-	-	-	-	-	-	-	-	-1.70	(5.37)
EXC10_SPORT	-	-	-	-	-	-	-	-	-5.65	(9.15)
EXC11_UNICORN	-	-	-	-	-	-	-	-	6.81	(5.59)
SCL_EXTR_CL	-	-	-	-	-	-	-	-	10.90	(5.08)
SCORE_PUBLIC	-	-	-	-	-	-	-	-	10.10	(4.75)
QUAL_RECORD	-	-	-	-	-	-	-	-	6.99	(6.77)
SCHSEL	-	-	-	-	-	-	-	-	1.57	(3.29)
R2	27.21		37.24		40.03		43.15		43.93	
N	48483		46267		44046		30051		25612	

Notes: Figures in parentheses are t-values (95% significance level). For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix.

The second set of variables, included cumulatively while retaining the earlier variables, relates to the home background and parents of students. In the earlier section on endowments, we explained that Vietnam has the lowest per capita income out of the eight countries included in the sample and it is natural that PISA indices on family wealth or parental education are much lower for Vietnam compared to the other 7 countries. Inclusion of these variables increase the coefficient on the Vietnam dummy and would take us away from our objective. So the parent variables that are retained and presented in column (3) are only

those variables that reduce the Vietnam dummy. The reduction amounts to only 11 points compared to the nearly 20 point reduction for student variables. Only the variable PARPRESSURE is statistically significant in this group and indeed has a sizeable impact on the score - this variable reports on principals claiming that "there is *constant pressure* from many parents, who expect our school to set very high academic standards and to have our students achieve them."

The third set of variables, related to teachers, is presented in column (4) and result in a reduction of the Vietnam dummy only by 3 points to a level of 95.13. This does not mean that teachers are unimportant as a reason for Vietnam's superior performance in mathematics, only that the observed teacher related variables in the PISA dataset do not collectively help as an explanation. In the regression itself, one can see that PROPCERT, proportion of certified teachers affects mathematics scores positively. The same goes for a few of student assessment related variables, including TCM_STUASS and STU_FEEDB, that relate to the use of student assessment and student written feedback to assess teachers.

The final set of variables, related to schools is presented in column (5), that results in a further reduction of the dummy coefficient by 12 points, to a level of 77.26. Interestingly, all the school variables with just one exception are statistically significant. There are interesting insights from some of these school variables. COMP_USE does not have a positive effect on the mathematics score, but COMPWEB does - recall that Vietnam does relatively better on internet connectivity compared to mere availability of computers. The presence of SCMATEDU and SCMATBUI - quality of school educational resources and quality of physical infrastructure - helps explain the gap, recall from Table 9 that Vietnam has superior endowments compared to the Dev7 countries. Table 10 shows that Extra classes organized by the school (SCL_EXTR_CL), and the "systematic recording of data including teacher and student attendance and graduation rates, test results and professional development of teachers" (QUAL_RECORD) are also part of the story. Public dissemination by the school of testing results (SCORE_PUBLIC) has a positive coefficient, which is also one of the variables where Vietnam appears to have twice as many schools following this practice.

Note that as we successively add variables in the regression equation, the number of observations in the regressions drops significantly due to missing values. Comparing available observable values to other variables (not reported here) for the dropped observations does not seem to indicate a systematic bias in this attrition. The 2012 PISA round included a so called 'rotated' module for the student's questionnaire. The idea of the rotated module was to ask additional sets of questions in a systematic division that increases the overall data available without burdening the respondents with excessively long questionnaires. The 'ro-

tated' variables are presented in tables in the Appendix. Appendix Table A2 for mathematics shows that the lowest possible value for the Vietnam dummy was 46.2. So a substantive (half a standard deviation) score gap is left unexplained from the PISA data, possibly due to a combination of economic and cultural effects not measured in PISA.

3.2 Reading

Table 11: The estimated impact of 'Vietnam' on Reading PISA test scores

	Reading									
Variables	(1)		(2)		(3)		(4)		(5)	
VIETNAM	105.16	(5.03)	85.03	(4.33)	75.49	(4.69)	74.13	(4.59)	60.31	(6.06)
FEMALE	-	-	25.84	(1.69)	25.24	(1.74)	26.65	(1.87)	23.02	(1.60)
PRESCHOOL	-	-	41.47	(3.67)	37.82	(3.78)	34.86	(3.83)	23.68	(3.40)
REPEAT	-	-	-58.46	(2.79)	-55.65	(3.03)	-52.78	(3.50)	-43.16	(3.24)
ST08Q01	-	-	-8.6	(1.29)	-8.31	(1.25)	-8.03	(1.38)	-7.67	(1.43)
ST115Q01	-	-	-7.9	(1.66)	-7.82	(1.68)	-9.63	(1.78)	-8.37	(1.80)
BOOK_N	-	-	-	-	0.08	(0.01)	0.06	(0.01)	0.05	(0.01)
PARPRESSURE	-	-	-	-	10.72	(4.32)	11.21	(4.24)	3.69	(4.18)
VOLUMOM	-	-	-	-	-0.05	(0.06)	-0.06	(0.05)	-0.03	(0.06)
FUNDMOM	-	-	-	-	0.2	(0.06)	0.17	(0.05)	0.1	(0.06)
COUNCILMOM	-	-	-	-	-0.12	(0.06)	-0.16	(0.06)	-0.09	(0.07)
DUTYMOM	-	-	-	-	-0.05	(0.06)	-0.08	(0.06)	-0.1	(0.07)
PROPCERT	-	-	-	-	-	-	9.14	(4.84)	3.14	(5.59)
TCSHORT	-	-	-	-	-	-	-3.93	(1.84)	0.47	(1.91)
TCM_STUASS	-	-	-	-	-	-	15.91	(7.67)	7.35	(8.22)
ASS_PROG	-	-	-	-	-	-	4.31	(16.68)	-15.85	(10.44)
ASS_PROM	-	-	-	-	-	-	6.25	(5.45)	13.94	(5.92)
ASS_NAT	-	-	-	-	-	-	5.71	(5.41)	1.44	(5.91)
ASS_CUR	-	-	-	-	-	-	-2.15	(7.50)	-3.81	(9.14)
STU_FEEDB	-	-	-	-	-	-	4.95	(4.67)	6.12	(4.28)
PCGIRLS	-	-	-	-	-	-	-	-	23.11	(10.88)
TOWN	-	-	-	-	-	-	-	-	-6.88	(3.71)
CLSIZE	-	-	-	-	-	-	-	-	0.95	(0.23)
COMPWEB	-	-	-	-	-	-	-	-	16.08	(5.56)
SCMATEDU	-	-	-	-	-	-	-	-	5.16	(2.52)
SCMATBUI	-	-	-	-	-	-	-	-	0.98	(2.35)
EXC2_PLAY	-	-	-	-	-	-	-	-	13.05	(3.92)
EXC6_MATHCOMP	-	-	-	-	-	-	-	-	7.65	(5.02)
EXC10_SPORT	-	-	-	-	-	-	-	-	-4.43	(10.86)
EXC11_UNICORN	-	-	-	-	-	-	-	-	10.61	(5.11)
SCORE_PUBLIC	-	-	-	-	-	-	-	-	5.24	(4.22)
LEADINST	-	-	-	-	-	-	-	-	1.54	(2.03)
QUAL_RECORD	-	-	-	-	-	-	-	-	-6.06	(7.10)
SCHSEL	-	-	-	-	-	-	-	-	1.39	(3.05)
TEACCLIM	-	-	-	-	-	-	-	-	-1.3	(2.63)
R2	19.61		34.5		36.45		39.63		41.84	
N	48483		46267		44046		35442		27331	

Notes: Figures in parentheses are t-values (95% significance level). For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix.

For scores on Reading (Table 11), the gap is lower to begin with: 105.16 compared to 128.05 for mathematics. The pattern revealed by the regessions is quite similar: the stu-

dent specific variables bring down the Vietnam dummy coeffcient to 85; the parent related variables accounts for a further 9 points, with only PARPRESSURE being statistically significant.

3.3 Science

Table 12: The estimated impact of 'Vietnam' on Science PISA test scores

	Science									
Variables	(1)		(2)		(3)		(4)		(5)	
VIETNAM	134.56	(4.91)	115.45	(4.37)	103.85	(4.56)	101.83	(4.63)	88.54	(5.99)
FEMALE	-	-	-2.21	(1.61)	-3.08	(1.58)	-1.95	(1.78)	-4.93	(1.46)
PRESCHOOL	-	-	43.06	(3.42)	37.94	(3.60)	36.09	(3.65)	24.36	(3.57)
REPEAT	-	-	-53.8	(2.63)	-50.74	(2.86)	-48.77	(3.26)	-40.6	(3.24)
ST08Q01	-	-	-9.28	(1.11)	-9.02	(1.16)	-8.76	(1.28)	-8.45	(1.26)
ST115Q01	-	-	-5.95	(1.68)	-5.55	(1.72)	-6.88	(1.81)	-6.18	(1.89)
BOOK_N	-	-	-	-	0.08	(0.01)	0.06	(0.01)	0.06	(0.01)
PARPRESSURE	-	-	-	-	5.87	(3.94)	6.42	(3.96)	-0.27	(3.76)
FUNDMOM	-	-	-	-	0.25	(0.05)	0.22	(0.05)	0.17	(0.06)
COUNCILMOM	-	-	-	-	-0.18	(0.05)	-0.2	(0.05)	-0.12	(0.06)
DUTYMOM	-	-	-	-	-0.02	(0.05)	-0.04	(0.06)	-0.06	(0.07)
PROPCERT	-	-	-	-	-	-	11.67	(4.91)	5.35	(5.47)
TCSHORT	-	-	-	-	-	-	-0.68	(1.82)	2.7	(1.83)
TCM_STUASS	-	-	-	-	-	-	16.04	(6.86)	9.43	(7.39)
TCM_PEER	-	-	-	-	-	-	-2.65	(6.05)	-5.68	(5.79)
ASS_PROG	-	-	-	-	-	-	-5.42	(16.65)	-23.01	(9.17)
ASS_PROM	-	-	-	-	-	-	4.23	(5.79)	12.41	(6.68)
ASS_NAT	-	-	-	-	-	-	7.33	(4.71)	1.49	(4.93)
ASS_SCH	-	-	-	-	-	-	2.63	(6.01)	0.66	(6.72)
ASS_CUR	-	-	-	-	-	-	-6.33	(7.54)	-4.87	(8.73)
STU_FEEDB	-	-	-	-	-	-	4.59	(4.48)	5.90	(4.68)
PCGIRLS	-	-	-	-	-	-	-	-	18.92	(11.11)
PRIVATESCL	-	-	-	-	-	-	-	-	-1.03	(5.34)
TOWN	-	-	-	-	-	-	-	-	-8.25	(3.16)
CLSIZE	-	-	-	-	-	-	-	-	0.83	(0.20)
COMPWEB	-	-	-	-	-	-	-	-	17.22	(5.61)
SCMATEDU	-	-	-	-	-	-	-	-	5.38	(1.75)
EXC2_PLAY	-	-	-	-	-	-	-	-	8.52	(3.34)
EXC6_MATHCOMP	-	-	-	-	-	-	-	-	1.5	(4.53)
EXC10_SPORT	-	-	-	-	-	-	-	-	-1.73	(9.13)
EXC11_UNICORN	-	-	-	-	-	-	-	-	8.56	(5.04)
SCORE_PUBLIC	-	-	-	-	-	-	-	-	11.28	(3.75)
LEADINST	-	-	-	-	-	-	-	-	1.57	(1.95)
QUAL_RECORD	-	-	-	-	-	-	-	-	-0.92	(5.55)
SCHSEL	-	-	-	-	-	-	-	-	1.52	(3.11)
TEACCLIM	-	-	-	-	-	-	-	-	-1.82	(2.46)
R2	30.75		41.14		43.35		46.11		47.35	
N	48483		46267		44046		35302		27224	

Notes: Figures in parentheses are t-values (95% significance level). For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix.

Teacher related variables for Reading only account for a further decline of 2 points, and school variables reduced the dummy by 14 points to a level of 60.31 reported in column

(5) of Table 11. Appendix Table A3 reports the regressions with rotated variables included which brings the dummy coefficient down to a lowest level of 52.04. Finally we look at the Science results.

The gap between Vietnam and Dev7 is largest for science scores, with column (1) in Table 12 indicating the dummy coefficient at 134.56. The pattern of reduction in the dummy is again similar to the previous two subjects - with the student specific variables accounting for the biggest decline (19 points) , followed by school (13 points), parents (11.5 points) and teacher related variables (2 points). The final specification reduces the dummy to 88.54. Together with rotated variables, presented in Appendix Table A4, the lowest value for the Vietnam dummy is 80.09, a total reduction of 55 points explained, but still leaving a large portion unattributable through the Fryer-Levitt method.

3.4 Summarized insights from Fryer-Levitt

We can see that across the three test subjects, the Vietnam dummy comes down by nearly 50 points, or half a standard deviation. We find that student, parent and school related variables appear to explain part of Vietnam's superior performance in PISA.

Students: The student related variables reflect two policy elements that could be useful for other countries that seek to learn from Vietnam. The investment made by Vietnam in Preschool appears to have long lasting effects, and indeed in Vietnam the government continues to invest deeply not only for universal Preschool, but also for early childhood care services even prior to Preschool. A policy lesson can also be derived from the effect of repetition - cause and effect is difficult to extract in the case of repetition and test score performance, but one can see that repetition is much lower in Vietnam (Table 1) and the regression coefficient on a student being a repeater has a large negative value, even in the final specification with all other variables included. The other student related variables regarding being late for school and skipping classes perhaps do not have clear policy implications for other countries but help us understand a cultural effect regarding Vietnam.

Parents: As noted in the text, the household wealth/possessions, parents' education levels and socio-economic indices reflect Vietnam's per capita GDP and act against explanations of the test score gap. Following the trend, Vietnam would have benefited from a much higher gap if it had been a wealthier country. There is an advantage that Vietnamese children have in having more demanding parents (though perhaps Vietnamese teenagers may not always see it that way). The parents are demanding not only of their children, but apparently also of the schools, and generally parents appear to back up their demands by contributing on

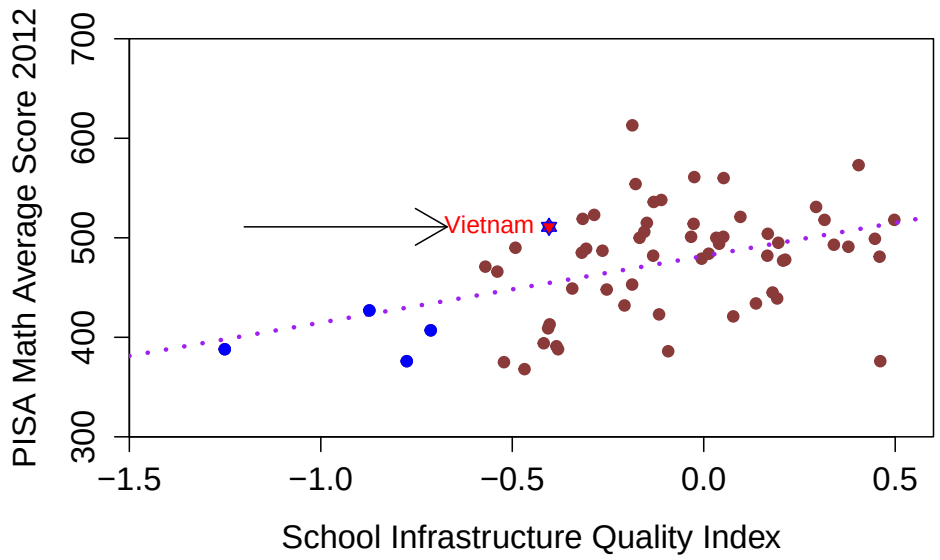
their own as volunteers. Interestingly, even though the individual coefficients of parent related variables are not statistically significant except for one variable, the variables appear to collectively influence the dummy coefficient up to one-tenth of a standard deviation of test scores. As Amy Chua [Chua, 2011] attested, parental attitudes and behaviors are deeply influenced by cultural norms. However, there is a policy lesson here too, concerning the freedom of access provided to parents to take part in the school life. Sometimes schools tend to be insular places without much scope for parents to contribute, but measures to harness parents' contributions in their time as well as in cash and kind may yield positive results.

Teachers: Teachers are widely recognized to be the most important factor in many studies of student achievement. Yet, in this case, the inclusion of a number of teacher related variables does not appear to be useful in explaining Vietnam's achievement gap. It is interesting to note that in the regressions the variables individually tend to have statistically significant coefficients, but do not affect the dummy coefficient. One teacher variable, the proportion of certified teachers, is clearly economically and statistically significant, and it is one where Vietnam has an advantage (80% vs. 68% certified). Variables that relate to the use of student assessment in providing feedback to teachers on their performance are seen to be important. The presence of other assessment and feedback related variables are also in line with intuition. It is possible that the advantages which Vietnam enjoys with regard to teachers are swamped by the effects of variables for which Vietnam does not have an advantage, so the net result is that the gap is not explained by PISA related teachers variables. It is also possible that the effect of teachers is particularly context specific, so we can see the weakness of the pooled regression approach of Fryer-Levitt. This last explanation is further investigated in the next section of the paper.

School School resources matter with regard to PISA results in the international perspective - as the scatter plot in Figure 1 motivating this paper clearly shows. Developing countries with the notable exception of Vietnam are clustered at the bottom left hand side. And there is a positive slope with high scoring countries tending to be on the higher income side. In this section, we see that the effort made by the Vietnamese government to invest in education plays an important part in explaining the achievement gap. Even though Vietnam may be poor with regard to per capita income, it is not as poor with regard to the quality of educational resources and the quality of physical infrastructure. This can be seen in Figure 4, where Vietnam moves to the right as compared to Figure 1, where it is the country with the lowest GDP per capita in the entire dataset. With regard to SCMATBUI (quality of school infrastructure), Vietnam jumps ahead 11 places, with a similar story (not shown) regarding SCMATEDU (quality of educational materials). A key reason is the investments

in schools in smaller towns and rural areas as classified by PISA - the dispersion of school infrastructure is lower in Vietnam compared to other countries.

Figure 4: PISA 2012 results compared with School Infrastructure Quality



Source:OECD-PISA database

4 Regression Approach II: Oaxaca-Blinder Decomposition

A key weakness of the Fryer-Levitt approach is that the pooled regression does not allow for regression coefficients to be different across countries. In this section, we set aside the Fryer-Levitt method to look at the data from a different analytical perspective. We use the Oaxaca-Blinder decomposition (OB) method, that has recently become quite popular for PISA analysis after the initial work by [Ammermueller, 2007] comparing the PISA results of Finland and Germany.

4.1 Overview of the OB Decomposition

The objective of OB is to decompose the mean differences. In this case the mean difference in Vietnam's PISA performance with each of the DEV7 countries individually. Extensions of OB allow for decompositions to be made throughout the distribution rather than only at the mean values, but we leave such an extension for further research regarding Vietnam's PISA performance. OB is based on a simple algebraic rearrangement of terms of the OLS

regression of test scores. The mean outcome difference to be explained ($\Delta\bar{Y}$) is simply the difference of the mean outcomes for Vietnam and the comparison country. let us denote the scores as $\bar{Y}_V$ and $\bar{Y}_O$, respectively:

$$\Delta\bar{Y} = \bar{Y}_V - \bar{Y}_O \tag{2}$$

Now, as the OLS error terms are of mean zero by construction, (2) can be represented by

$$\Delta\bar{Y} = \bar{\boldsymbol{X}}'_V\hat{\boldsymbol{\beta}}_V - \bar{\boldsymbol{X}}'_O\hat{\boldsymbol{\beta}}_O \tag{3}$$

In the twofold version of OB that we use in this paper, (3) can be represented either as

$$\Delta\bar{Y} = \underbrace{(\bar{\boldsymbol{X}}_V - \bar{\boldsymbol{X}}_O)'\hat{\boldsymbol{\beta}}_V}_{\text{endowments}} + \underbrace{\bar{\boldsymbol{X}}'_O(\hat{\boldsymbol{\beta}}_V - \hat{\boldsymbol{\beta}}_O)}_{\text{coefficients}} \tag{4}$$

or as

$$\Delta\bar{Y} = \underbrace{(\bar{\boldsymbol{X}}_V - \bar{\boldsymbol{X}}_O)'\hat{\boldsymbol{\beta}}_O}_{\text{endowments}} + \underbrace{\bar{\boldsymbol{X}}'_V(\hat{\boldsymbol{\beta}}_O - \hat{\boldsymbol{\beta}}_V)}_{\text{coefficients}} \tag{5}$$

depending on which country is used as a reference country. It is not obvious which of the specifications (4) or (5) is better, and OB variations include further combinations of the two. We focus on this paper on the approach of (4), using Vietnam as the reference, and leave (5) and additional OB variations to subsequent research.

We base the choice of regression specification on the findings so far. In line with per capita GDP of Vietnam compared with the Dev7 variables, there are a series of income level or wealth related variables for which Vietnam does poorly in comparison with Dev7. We term these variables WEALTH related variables. We include in it all variables for which Vietnam has poorer endowments, and the term WEALTH denotes that they have higher mean values in Dev7 countries which are wealthier than Vietnam. These variables have typically not been included in the Fryer-Levitt regressions as they would have exacerbated rather than reduced the Vietnam gap. For example, the set includes mother's highest level of education, or MISCED, which is one ISCED level higher for Dev 7 as compared to Vietnam. A second set of variables, which we term as ED WEALTH are typically variables for which Vietnam does better and are good for education results. For instance, Vietnam has higher

level for PRESCHOOL, and for time spent by students in mathematics lessons after school, OUTMATH. These two sets of variables together constitute the specification of the $\boldsymbol{X}_V$ and $\boldsymbol{X}_O$ vectors.

Now it is an established result that the matrix decomposition reported in equation 8 also holds at the variable level, as the overall decomposition is nothing else but the sum of variable level decompositions [Hlavac, 2015]. We extend this notion further to look at aggregations by the two sets of variables - ED WEALTH and WEALTH. In the equations below, we have m variables in the EDWEALTH set and n variables in the WEALTH set:

$$\underbrace{(\bar{\boldsymbol{X}}_A - \bar{\boldsymbol{X}}_B)'\hat{\boldsymbol{\beta}}_R}_{\text{endowments}} = \underbrace{\sum_{i=1}^{m}(\bar{X}_{iV} - \bar{X}_{iO})\hat{\beta}_{iV}}_{\text{ED WEALTH}} + \underbrace{\sum_{i=1}^{n}(\bar{X}_{iV} - \bar{X}_{iO})\hat{\beta}_{iV}}_{\text{WEALTH}} \tag{6}$$

$$\underbrace{\bar{\boldsymbol{X}}'_O(\boldsymbol{\beta_V} - \boldsymbol{\beta_O})}_{\text{coefficients}} = \underbrace{\sum_{i=1}^{m}\bar{X}_{iV}(\hat{\beta}_{OV} - \hat{\beta}_{iV})}_{\text{ED WEALTH}} + \underbrace{\sum_{i=1}^{n}\bar{X}_{iV}(\hat{\beta}_{OV} - \hat{\beta}_{iV})}_{\text{WEALTH}} \tag{7}$$

4.2 Findings from OB Decomposition

In Tables 13 through 15, we present the mathematics score findings from the OB decomposition for Vietnam compared with each of the Dev7 countries arranged in alphabetic order. The number "Sum Total ED WEALTH + WEALTH" in the bottom row indicates the mean difference between Vietnam and each of the Dev7 countries. The top panel in each of Tables 13 through 15 presents the ED WEALTH variables - these are variables related to educational performance where Vietnam does better on mean values as compared to the Dev7 countries. The lower panel in each of the tables presents the WEALTH variables - typically related to a country's income level, they are ones where the Dev7 countries do better. The paired column of numbers for each country indicate a hypothetical counter-factual. The 'Endowments' column indicates how much of the mean difference arises from a difference in the mean values, keeping the coefficients fixed at the level of Vietnam. The 'Coefficients' column indicates how much of the difference is due to the difference in coefficients between Vietnam an the compared country, keeping the characteristics fixed at the mean level of the compared country. We begin the analysis looking at Albania and Colombia in Table 13.

Table 13: OB Decomposition for mathematics: Sample Means, Albania and Colombia compared

		Mean value		Albania		Colombia	
Category	**Variable Name**	*Dev 7*	*Vietnam*	*Endowments*	*Coefficients*	*Endowments*	*Coefficients*
	INTERCEPT				100.7672		222.6017
Students	PRESCHOOL	0.7888	0.9120	3.2606	14.9314	0.1767	21.2995
	LATESCHOOL	1.5131	1.1872	2.5351	-16.1377	2.7914	-7.0084
	NOREPEAT	0.8085	0.9321	-1.1335	81.2394	9.752	5.6154
	SHRS	3.7566	3.9597	8.103	18.4864	2.1314	10.2102
Parents	OUTMATH	1.8280	3.1305	8.4386	5.9606	6.3176	13.8406
	PARPRESSURE	0.2665	0.3837	3.0612	6.3037	5.2187	5.0041
	TIGERMOM	52.4472	62.4183	0.0071	-3.1614	0.1958	-14.0056
	TEACHMOM	12.1764	38.2821	2.4287	4.431	2.0458	2.2844
Teachers	PROPCERT	0.6757	0.7961	-0.8449	6.3679	-	-
	MATHPROFDEV	40.5068	49.0086	0.0438	-0.353	-0.2447	-1.0775
	TCH_INCENTV	-0.0317	0.2687	3.4264	-2.4877	1.9205	-0.4223
	TCM_INSPE	0.5882	0.8664	-5.3929	-17.0471	-13.3928	-0.5966
	TCM_OBSER	0.8015	0.9785	-	-	-9.9929	-5.2289
	COMP_USE	0.4345	0.6447	-0.4169	-0.3193	-0.6	3.1921
	STU_FEEDB	0.7105	0.8419	-0.5089	7.7288	-0.3485	-10.1593
Schools	EXC6_MATHCOMP	0.6268	0.8032	0.3129	-9.663	-0.6487	-8.5158
	SCMATBUI	-0.6322	-0.3988	0.388	-4.8621	-0.0363	-0.4844
	SCL_EXTR_CL	0.6538	0.9584	-3.5828	-2.9217	-8.4506	-9.4397
	SCORE_PUBLIC	0.3450	0.7567	5.3549	3.4256	2.6639	4.0431
TOTAL ED WEALTH				25.4804	91.9218	-0.5007	8.5509
				18%	64%	0%	8%
Students	EXAPPLM	0.1111	-0.2418	1.9364	-0.5576	0.2362	1.6552
	EXPUREM	-0.1384	0.1587	-0.2203	1.3971	2.9206	0.9846
	LHRS	3.5990	3.2207	-3.359	-34.8084	9.528	-44.012
	MHRS	3.8960	3.7878	4.424	14.1238	-3.6621	14.9222
Parents	HISEI	40.4196	26.6023	-	-	-6.3504	7.3598
	MISCED	3.1193	2.1744	-5.6001	18.8463	-2.143	-1.2957
	WEALTH	-1.4606	-2.1343	0.4117	-1.4204	2.4134	17.4408
	CULTPOS	-0.1424	-0.2361	0.3533	0.5941	0.3183	0.327
	HEDRES	-0.7427	-1.0743	-3.3855	-5.5085	-4.8774	-7.6374
	BOOK_N	53.6393	50.7860	0.0053	-0.4736	-0.0504	-5.2598
Teachers	TXT_BOOK	0.7905	0.7855	-	-	-5.6426	-5.2097
	CLSIZE	35.0130	42.5043	-8.6779	-23.4445	-0.5804	-46.7664
	TCFOCST	0.4975	0.1402	2.9242	0.3422	2.7312	0.8924
	TCMORALE	0.0376	-0.2941	-6.2933	-0.0748	-7.7804	1.8946
	TCHPARTI	-0.2169	-1.6445	11.3136	4.9119	6.7157	1.8929
Schools	TOWN	0.4508	0.3101	5.0475	-6.7474	-3.0845	-2.9438
	VILLAGE	0.1403	0.4584	-7.49	-0.6774	-11.2676	-1.7407
	PRIVATESCL	0.1714	0.0832	-0.0055	-0.0083	4.4454	-2.5786
	STU_FEES	25.7233	16.6104	0.671	-10.8914	4.5328	-23.7404
	RATCMP15	0.3909	0.2216	2.9895	-4.1902	7.6894	-12.933
	SCHAUTON	-0.2542	-1.0419	-4.4263	-8.8247	-10.9579	-0.3955
	EXC1_BAND	0.4710	0.1678	0.5318	-8.6246	0.29099	-2.4563
TOTAL WEALTH				-8.8496	-66.0364	-14.57471	-109.5998
				-6%	-46%	-14%	-103%
SUM TOTAL (ED WEALTH & WEALTH)				**143.2834**		**106.4774**	
				100%		**100%**	

Notes: The 'Mean values' for Dev7 and Vietnam are taken from the whole data set and represent the same values used for Section 2 - Endowment Differences. They are included here to reiterate the categorization of variables into WEALTH and ED WEALTH, depending on their comparative values between Dev7 and Vietnam.

Table 13 shows that the mean difference between Albania and Vietnam for mathematics was 143, the highest Vietnam advantage amongst all Dev7 countries. The OB decomposition indicates that if Albanian 15 year olds had Vietnamese endowments on ED WEALTH variables, their score would have been higher by 18% and if they had had Vietnam's coefficients on those variables, their score would have been by 64%. Looking at the bottom panel, with Vietnam's WEALTH endowments, Albania's score would have been reduced by 6% and with Vietnam's WEALTH coefficients while retaining its own characteristics would have lowered the score by 46%. Interpretation needs to be made with care, a big boost would have come from the coefficient values on repetition, but this is probably driven by the rarity of repetition in Vietnam.

The mean difference is lower for Colombia at 106 points. Interestingly, differences on ED WEALTH endowments have negligible contribution and the coefficients on ED WEALTH only account for 8%. The endowments on WEALTH indicate a 14% reduction for Colombia by adopting Vietnamese endowments, and a large 100% reduction on grounds of coefficients. For Colombia, much more so than Albania, the difference lies in the differences on the intercept coefficient, after controlling for both ED WEALTH and WEALTH variables. The Colombia EDWEALTH coefficient column indicates some interesting results. While PRESCHOOL (students having attended PRESCHOOL) would have had a 21 point positive impact, note the -14 point negative impact on the variable called TIGERMOM (parents proactively following up with teacher regarding student's performance) and -10 point negative impact on STU_FEEDB (teachers obtain written feedback from students). This might indicate that some of the features of countries are related to cultural factors that come together as a package - being a 'Tiger Mom' may help the child in Vietnam, but perhaps not as much in Colombia!

A similar interpretation is possible regarding the variables TCM_INSPE and TCM_OBSERVER (teachers benefit from class room observation by external inspectors and principal/senior school staff) and SCL_EXTR_CL (extra classes at school). These have a negative value in the endowment column as well as the coefficients column. This means that if Colombian students had Vietnamese characteristics on these variables, the mean result for Colombia would have been lower than it already is. The interpretation would be that what is good for Vietnamese students, in a Vietnamese context, as measured in PISA, may not be good for Colombian students. However, this finding should be taken with some caution as there are also some variables, like OUTMATH (time spent in extra classes for math outside of school) which have positive values on the endowments and the coeffcients. Table 14 presents data from the next three countries - Indonesia, Jordan and Peru.

Table 14: OB Decomposition for mathematics: Indonesia, Jordan and Peru compared

		Indonesia		Jordan		Peru	
Category	**Variable Name**	*Endowments*	*Coefficients*	*Endowments*	*Coefficients*	*Endowments*	*Coefficients*
	INTERCEPT		181.3475		232.8262		247.8394
Students	PRESCHOOL	6.2309	6.0373	2.9304	8.8395	0.8096	6.8201
	LATESCHOOL	1.3545	0.1656	4.0339	-17.9123	5.3749	-6.8398
	NOREPEAT	3.0327	15.4797	-0.5863	-0.5305	5.1146	8.7662
	SHRS	3.6461	3.2498	-3.4578	-1.8296	2.56	19.0496
Parents	OUTMATH	9.9458	3.9547	8.4886	12.3205	3.6561	14.5438
	PARPRESSURE	0.2358	7.19	2.9216	8.3922	1.9524	4.8938
	TIGERMOM	-1.4622	-5.0425	-1.456	0.7928	-0.6088	3.4834
	TEACHMOM	2.1566	1.7254	2.0207	0.5374	1.4841	3.9414
Teachers	PROPCERT	1.0728	7.8387	-	-	-	-
	MATHPROFDEV	-0.0778	-4.2427	0.1404	0.0539	0.0423	-3.9528
	TCH_INCENTV	0.2442	0.6929	-0.3897	1.002	2.6139	-1.3882
	TCM_INSPE	-1.7713	-7.5635	2.0905	4.5083	-6.3926	-11.6551
	TCM_OBSER	-0.0742	11.6516	0.0738	-11.522	-1.9658	-37.8481
	COMP_USE	-0.6291	1.714	0.1317	-6.769	-0.3406	1.8251
	STU_FEEDB	0.0796	7.9599	-0.4144	-4.888	-0.6405	5.056
Schools	EXC6_MATHCOMP	-0.3133	1.5705	-0.8381	-2.5399	0.0019	-10.8913
	SCMATBUI	0.0048	-1.1337	0.2473	-3.7528	-0.0379	-0.7149
	SCL_EXTR_CL	-2.9043	-20.2148	-4.3968	-9.0748	-8.1854	-11.5939
	SCORE_PUBLIC	5.7895	1.2721	5.9804	4.7486	7.0514	2.4778
TOTAL ED WEALTH		26.5611	32.305	17.5202	-17.6237	12.4896	-14.0269
		19%	23%	15%	-15%	10%	-11%
Students	EXAPPLM	1.2618	-0.0988	2.5477	-1.9561	1.7418	-0.0448
	EXPUREM	2.1991	0.1956	2.1748	2.0725	-0.0688	-1.3801
	LHRS	-2.0941	-29.3342	15.7577	-58.088	14.0996	-56.6772
	MHRS	1.0459	14.6798	-0.1466	43.9865	-4.8692	13.7176
Parents	HISEI	-1.7446	-0.6415	-	-	-3.7414	3.6262
	MISCED	-0.4967	6.245	-5.2108	-3.2033	-1.2325	-10.9724
	WEALTH	-0.5319	-1.6968	1.5112	0.8037	1.4103	17.2629
	CULTPOS	-0.3684	0.7266	-0.1767	0.9315	0.4633	1.8325
	HEDRES	2.5025	-8.659	-5.509	-3.607	-6.0766	-3.1882
	BOOK_N	-0.062	1.7571	-0.2911	-0.1599	0.0089	-6.5238
Teachers	TXT_BOOK	1.2766	-17.5263	3.5046	-16.7213	0.629	-14.3821
	CLSIZE	-4.7921	-13.5878	-5.4853	-59.9741	-9.4773	-36.5348
	TCFOCST	4.5553	-4.0316	1.1106	-0.8656	1.4043	-0.7333
	TCMORALE	-9.9416	1.028	-0.4259	-1.4027	-1.9897	-0.2643
	TCHPARTI	18.5498	-10.6116	0.5336	8.9057	14.9263	-0.3443
Schools	TOWN	5.1411	-1.5651	2.5742	-2.1225	1.4527	-6.9018
	VILLAGE	-7.3432	-1.496	-10.417	-1.5033	-8.1092	-1.6368
	PRIVATESCL	2.0065	0.0116	6.1701	-12.8976	10.9349	-11.4833
	STU_FEES	11.4805	-29.6824	-	-	-	-
	RATCMP15	-1.56	-11.0681	3.8324	-25.5703	3.6968	-11.777
	SCHAUTON	-17.2045	8.6425	1.6804	5.5624	-10.3639	0.5217
	EXC1_BAND	0.4597	-7.9357	0.0348	-2.8344	-0.118	0.1559
TOTAL WEALTH		4.3397	-104.6487	13.7697	-128.6438	4.7213	-125.7274
		3%	-75%	12%	-109%	4%	-100%
SUM TOTAL (ED WEALTH & WEALTH)			**139.9046**		**117.8486**		**125.2960**
			100%		**100%**		**100%**

Notes: The 'Mean values' for Dev7 and Vietnam are taken from the whole data set and represent the same values used for Section 2 - Endowment Differences. They are included here to reiterate the categorization of variables into WEALTH and ED WEALTH, depending on their comparative values between Dev7 and Vietnam.

Table 14 indicates that in the case of Indonesia, the gap to be explained is 140 points. Endowments and coefficients on ED WEALTH account for 19% and 23% of the gap. The ED WEALTH variables explain more as compared to Colombia. The PRESCHOOL variable has 6 points explanation on each of endowments and coefficients. Other ED WEALTH variables with relative large positive contributions on endowments for Indonesia include OUTMATH and SCORE_PUBLIC. The variables TIGERMOM and SCL_EXTR_CL have negative contributions on endowments. On the coefficients side for ED WEALTH, we see big contributions from the coefficients on NOREPEAT, PROPCERT (Percentage of teachers who are formally certified), and TCM_OBSERVER. There are some variables that consistently stand out, for example PRESCHOOL and SCL_EXTR_CL. When we look at the WEALTH related variables, we see that the endowments of Indonesia would not have made such a big impact, pointing to the fact that Indonesia is closest to Vietnam amongst the Dev7 countries on per capita income. Of a similar magnitude with Colombia, we can see that the WEALTH coefficients of Vietnam would set back Indonesian students by 75%.

With Jordan, the gap to be explained is 118 points. On the ED WEALTH variables, endowment differences with Vietnam make for a 15% contribution and the coefficients make for a negative 15% contribution. So Vietnamese endowments on ED WEALTH would make a reasonable contribution for Jordanian students, but the coefficients would pull in the opposite direction. Six variables contribute mainly to this negative direction - LATESCHOOL (number of times arriving late in the schoolday), TCM_OBSER (teacher classroom observation by principal or senior school staff), STU_FEEDB (written feedback from students for teacher), SCL_EXTR_CL, EXC6_MATHCOMP (mathematics competition as extra-curricular activity) and SCMATBUI (index of quality of school infrastructure). On the WEALTH side, there is a 12% positive contribution of endowments and a negative 109% contribution of coefficients. The variables which contribute to this anomalous result include PRIVATESCL, LHRS (hours of language instruction) and RATCMP15 (available computers for 15 year olds).

Finally from Table 14, we can see that for Peru, ED WEALTH endowments make a 10% positive contribution and the coefficients make a -11% contribution. ED WEALTH variables that make a positive contribution in the coefficients column include PRESCHOOL, SHRS (hours of science instruction) and all the parent related variables. On the WEALTH endowments, there is a 4% positive contribution and a -100% contribution from coefficients. We turn next in Table 15 to comparisons with the remaining two countries, Thailand and Tunisia. Table 15 also includes a comparison with Shanghai, which is presently discussed.

Table 15: OB Decomposition for mathematics: Thailand, Tunisia and Shanghai compared

		Thailand		Tunisia		Shanghai	
Category	**Variable Name**	*Endowments*	*Coefficients*	*Endowments*	*Coefficients*	*Endowments*	*Coefficients*
	INTERCEPT		197.3024		220.3262		-88.5547
Students	PRESCHOOL	-1.3537	-17.271	6.1004	8.8937	1.0135	3.3683
	LATESCHOOL	2.4103	-6.5245	5.1805	-13.6441	-0.7333	-9.4329
	NOREPEAT	-0.8545	18.0457	11.7885	-24.2972	-2.4686	18.736
	SHRS	-4.6096	-1.3158	6.821	12.3146	2.7618	11.5291
Parents	OUTMATH	6.7928	12.3212	1.5262	12.4973	1.4415	-19.6668
	PARPRESSURE	-1.4518	4.2812	6.05	-2.0319	-3.295	-2.5603
	TIGERMOM	-0.388	-2.3087	-4.5979	-4.6769	1.7009	-8.999
	TEACHMOM	2.753	0.1281	3.4577	-0.343	-4.4387	3.3083
Teachers	PROPCERT	-0.4727	31.4282	1.103	-1.8785	8.3337	43.4759
	MATHPROFDEV	0.2289	0.5997	-0.0296	-5.3119	0.0199	0.5484
	TCH_INCENTV	-0.3042	2.7973	1.7686	-0.8613	0.3293	0.0993
	TCM_INSPE	-6.9777	-9.7581	0.5072	-16.981	0.4269	23.093
	TCM_OBSER	-0.0414	35.1591	-0.8747	8.2309	-0.0214	-65.8268
	COMP_USE	0.0932	3.2715	-1.3139	2.006	2.1571	-3.3878
	STU_FEEDB	-0.0804	-3.4671	-1.645	-0.1837	0.9525	15.1379
Schools	EXC6_MATHCOMP	-0.6327	-15.9607	-1.3721	-0.8139	-7.5785	46.1336
	SCMATBUI	0.4918	-0.3168	1.4125	-13.0502	1.369	-0.9102
	SCL_EXTR_CL	-0.299	-31.4213	-3.8009	-17.7227	-6.1388	29.4929
	SCORE_PUBLIC	0.1084	-1.5941	7.2212	-0.7671	-13.9127	6.2176
TOTAL ED WEALTH		-4.5873	18.0939	39.3027	-58.6209	-18.0809	90.3565
		-6%	25%	35%	-52%	-22%	111%
Students	EXAPPLM	2.6597	-0.6224	-0.0268	0.7122	-1.635	0.0304
	EXPUREM	1.1331	-0.244	3.0066	0.953	-0.0536	-1.354
	LHRS	-10.6968	-28.5366	23.1941	-63.0774	-11.4368	1.8702
	MHRS	0.4215	-18.4475	-3.834	24.3011	4.4884	7.1219
Parents	HISEI	-3.7308	3.9065	-4.5879	-17.802	8.6256	0.6227
	MISCED	-1.5344	-3.2852	-0.8438	9.0345	2.0466	0.206
	WEALTH	1.9975	4.6253	0.8843	5.3532	-6.7778	6.9447
	CULTPOS	0.2273	-0.0479	-0.5056	0.2824	2.4812	-0.9197
	HEDRES	-6.2788	-2.0394	-2.857	-5.5976	7.1149	2.2072
	BOOK_N	-0.3221	-4.9515	0.1597	0.8503	5.1709	4.2595
Teachers	TXT_BOOK	2.749	-10.9737	3.2614	-33.4627	-2.4418	0.6483
	CLSIZE	-3.667	-20.3239	-8.5485	10.7592	0.4045	23.7015
	TCFOCST	4.7078	-9.8512	-2.34511	1.3381	0.0868	0.7556
	TCMORALE	-4.4468	1.0381	3.9636	1.4813	0.5319	2.9116
	TCHPARTI	27.6836	-19.9891	3.4112	7.9172	-0.8565	-11.9873
Schools	TOWN	3.5728	-3.3756	6.7826	6.9162	-	-
	VILLAGE	-9.3596	-2.0706	-11.82	0.9214	-	-
	PRIVATESCL	0.1877	1.3994	-	-	1.9492	3.1875
	STU_FEES	0.2682	-8.9641	-0.355	-19.7408	-0.1311	3.278
	RATCMP15	7.5765	-21.4644	1.8275	-7.3367	-3.1063	3.4899
	SCHAUTON	-21.8484	10.7935	-2.7901	-17.2538	-7.8405	20.4172
	EXC1_BAND	0.6927	3.9018	0.154	-3.1367	24.6725	6.7965
TOTAL WEALTH		-8.0073	-129.5225	8.1311	-96.5876	23.2931	74.1877
		-11%	-177%	7%	-86%	29%	91%
SUM TOTAL (ED WEALTH & WEALTH)			**73.2792**		**112.5516**		**81.2017**
			100%		**100%**		**100%**

Notes: The 'Mean values' for Dev7 and Vietnam are taken from the whole data set and represent the same values used for Section 2 - Endowment Differences. They are included here to reiterate the categorization of variables into WEALTH and ED WEALTH, depending on their comparative values between Dev7 and Vietnam.

Table 15 includes the remaining set of Dev7 countries - Thailand and Tunisia. Thailand is the country with the lowest difference in mathematics score - only 73 points behind Vietnam, with Tunisia being 113 points behind. The OB decomposition for Thailand indicates a -6% contribution of endowments on EDWEALTH and a 25% contribution on coefficients. On the WEALTH set of variables, the contribution for Thailand was -11% on endowments and -177 % on coefficients. Tunisia indicates the highest positive value of all countries of 35% on ED WEALTH endowments and also the highest negative value of -52% on the coefficients. The results for WEALTH for Tunisia indicates a 7% contribution on endowments and a -86% contribution on endowments. The constituent variables have made their appearance in the previous commentary - for example, the contributions to the negative value on ED WEALTH coefficients for Tunisia comes from LATESCHOOL (-13.6), NOREPEAT (-24.3), TIGERMOM (-4.6), SCMATBUI (-13.05), and SCL_EXTR_CL (-17.72).

Overall, the OB decompositions support the previous findings. In five of the seven Dev7 countries, the ED WEALTH variables show a positive contribution on endowments - meaning that if the other countries had had Vietnam's endowments on ED WEALTH variables, their performance would have been better. On the coefficients side of ED WEALTH, we see a different picture - the contributions range from +64% for Albania to -52% for Tunisia, with other countries ranged in between. The two Asian countries (Indonesia and Thailand) have similar contributions of 23% and 25%. The predictable WEALTH set of decompositions is of less interest to us as in most cases there are small effects on endowments and large negative effects on coefficients.

With cross-section data in a non-experimental context, it is very difficult to make definitive conclusions, and only tentative can be made that hint at some answers. The findings on Dev7 countries indicated that it is possible that a number of advantages that Vietnam enjoys indicated in ED WEALTH can only function effectively as a package. One way to consider this is through a cultural lens - meaning that there is something specific to Vietnamese culture, that enables Vietnam to benefit from hard working students and teachers, with the guidance of committed and involved parents, even in cities and small towns. One way to test this hypothesis is by extending the comparison to a different comparator - Shanghai, China which has the best performance of all PISA 2012 countries, exceeding Vietnam's high performance by 86 points on mathematics. Table 15 shows the results if Vietnamese students had obtained Shanghai's endowments and coefficients.[10] The interesting finding here is the negative effect of ED WEALTH endowments and the roughly similar positive effect of coefficients on both ED WEALTH and WEALTH variables.

[10] For all other countries we used the respective country as the basis; here we are using Vietnam as the base country.

5 Conclusion

This paper has sought to focus attention and find insights regarding a most remarkable result - the superlative performance of Vietnam on the PISA 2012 tests, a country with the lowest per capita income amongst all PISA participants. While there exists a long tradition of research into understanding the performance of consistent top performers on PISA, such as Finland and Singapore, the literature so far has not focused on Vietnam's performance. Vietnam, with a mean PISA math score of 511 is not one of the very top performers. However, when compared with other lower middle income countries that take part in PISA, Vietnam is a clear outlier, with a nearly 100 point advantage over other countries in the sample. Using an arbitrary cut-off of US$10,000 per capita income (for 2010 PPP estimates), this paper focuses on comparing Vietnam's PISA results with 7 other countries, termed as Dev7 herein: Albania, Colombia, Indonesia, Jordan, Peru, Thailand and Tunisia. The methodology used in the paper is straightforward - we distribute the available information from PISA into the following categories: students, parents, teachers, and schools and seek to understand the source of Vietnam's gap by looking at mean comparisons, a Fryer-Levitt approach and an Oaxaca-Blinder decomposition. The following three concluding points can be made as a result of the analysis presented in this paper.

1. Half the gap can be explained: Even though the PISA dataset is rich and covers many aspects related to the achievement of student scores with international standardization of measures, with all the available variables, we could explain at best about 50% of the performance gap of Vietnam. While explaining half of the gap is perhaps better than not being able to explain any of the gap, the fact does remain that it appears difficult to explain the difference using only the PISA variables. Further research can seek to supplement the PISA data with other data sources regarding education systems and the educational context. The PISA 2015 application will be especially interesting to study as it will provide another important data point and enable a trend analysis to be conducted.

2. Cultural factors are likely very important: A combination of three sets of factors appear to be the most potent explanation for Vietnam's performance: First, the Vietnamese students may be working harder - we see they have less instances of skipped classes and being late for school, spend about the same time or more during school hours and substantial extra time after school. While at school, it is also possible that students are more disciplined and focused on their studies. Second, the teachers appear to benefit from a closer supervision of their work by the school principal and others, and there may be a stronger harmony between the hard working students and their teachers. Third, parents

may have an important role to play, by taking an active part in combining high expectations from their children by following up with their children's teachers and contributing at school.

3. Resources do appear to matter: When we compare PISA performance across the range from lower income non-OECD countries to the high income OECD countries, we find a clear positive trend. Vietnam has so far been the only PISA outlier, with a performance on par with much wealthier countries, and in fact one of the top performing countries in Science. The relationship between resource incentive inputs and educational test scores does not appear to be different for Vietnam - the analysis in this paper shows that Vietnam's results, extrapolating from co-variation on resources within the country, would have been much better with a higher level of resources. The analysis also indicates that with regard to educational resources, Vietnam may be reaping the benefits of policy regarding investments in education - the most important factor is probably the higher level of access to pre-school. A second factor is the investment in school infrastructure, especially in the cities and small towns.

The unique combination of focused educational investments beyond its income level and a cultural heritage that has positive behavioral implications for students appear to be part of the story behind Vietnam's educational success.

Appendix

Table A1: Summary statistics - Additional variables used for regressions

		Dev7 countries		Vietnam	
Variable	Description	MS	Valid N	MS	Valid N
ATSCHL *(r)*	Attitude towards school - learning is useful	0.1616 (0.9986)	25563	0.143 (0.8648)	3246
ATTLNACT *(r)*	Attitude towards school - studying pays off	0.1233 (0.964)	25368	-0.535 (0.8212)	3248
TCHQUAL_DIFF *(r)*	with different teacher student would work harder	0.5249 (0.4994)	24986	0.363 (0.481)	3231
BKGR_FAMPROB *(r)*	Problems at home deter effort in school	0.4705 (0.4991)	25038	0.264 (0.4409)	3231
MTSUP *(r)*	Mathematics supportive teaching style	0.4778 (0.9613)	25918	0.3685 (0.774)	3247
TCHBEHTD *(r)*	Teacher oriented inctruction method	0.4973 (1.0798)	26433	0.2964 (0.8099)	3254
TCHBEHSO *(r)*	Student oriented instruction method	0.7921 (0.9545)	26358	0.2969 (0.819)	3248
TCHBEHFA *(r)*	Assessment used to help students perform better	0.4634 (0.9934)	26245	0.005 (0.79)	3246
TCSHORT	Shortage of teaching staff	0.4742 (1.2601)	43144	0.418 (1.1628)	4959
TCFOCST	Teacher focus	0.4932 (1.0049)	43422	0.1321 (0.8347)	4959
ST72Q01 *(r)*	Class size in 'test language'	31.0133 (9.3337)	23946	41.0018 (5.4001)	2735
LHRS *(r)*	Learning time (hours per week) in 'test language'	3.599 (1.9887)	22177	3.2207 (1.1576)	2870
MHRS *(r)*	Learning time (hours per week) in mathematics	3.896 (2.0335)	21913	3.7878 (1.3764)	2850
SHRS *(r)*	Learning time (hours per week) in science	3.7566 (2.5078)	21701	3.9597 (2.5484)	2473
Quality assurance of mathematics teachers through ...					
TCM_STUASS	test or assessment of student achievement	0.8734 (0.3325)	43048	0.9821 (0.1328)	4959
Assessment used to					
ASS_PROG	inform parents about childs progress	0.9669 (0.179)	42703	0.9929 (0.0837)	4959
ASS_PROM	decide on students? retention or promotion	0.8998 (0.3002)	42478	0.9516 (0.2146)	4959
ASS_NAT	compare school to national performance	0.6951 (0.4604)	42450	0.8804 (0.3245)	4959
ASS_CUR	identify improvements in the curriculum	0.8978 (0.3029)	42475	0.9141 (0.2803)	4959
School policy related factors					
EXC11_UNICORN	School offers 'country specific item'	0.7108 (0.4534)	41907	0.9635 (0.1875)	4959
LEADINST	Promotion of instructional leadership	0.0732 (1.0797)	43253	-0.0465 (0.9424)	4959
QUAL_RECORD	Systematic recording of data for quality assurance	0.8824 (0.3221)	42939	0.9821 (0.1328)	4959
SCHSEL	School selectivity/ student admission policies	2.3036 (0.7997)	43296	2.8411 (0.4074)	4959

Notes: The variables relate to the questionnaires administered to schools and students in the rotated booklet, marked with *(r)*. For a more detailed description of variables, please see Tables A5, A6, A7 in the Appendix. The variable means of Dev7 and Vietnam are statistically different at the 95% significance level, except ATTSCHL.

Table A2: The estimated impact of 'Vietnam' on Mathematics PISA test scores - rotated questionnaire variables

	Mathematics					
Variables	(6)		(7)		(8)	
VIETNAM	60.83	(6.97)	49.59	(7.32)	64.81	(7.73)
PRESCHOOL	22.16	(3.47)	19.19	(3.87)	24.13	(4.29)
REPEAT	-30.31	(3.58)	-27.82	(3.11)	-32.25	(2.85)
ST08Q01	-5.75	(1.57)	-8.21	(1.54)	-5.14	(1.61)
ST115Q01	-4.3	(1.85)	-2.99	(2.14)	-2.83	(1.91)
BOOK_N	0.05	(0.01)	0.05	(0.01)	0.07	(0.01)
PARPRESSURE	8.73	(3.95)	9.13	(4.21)	6.99	(4.43)
PCGIRLS	8.97	(12.13)	0.16	(0.06)	0.2	(0.07)
FUNDMOM	0.18	(0.06)	-0.1	(0.07)	-0.12	(0.07)
COUNCILMOM	-0.12	(0.06)	-0.09	(0.07)	-0.08	(0.07)
DUTYMOM	-0.07	(0.06)	10.42	(6.65)	17.84	(7.32)
PROPCERT	15.7	(6.22)	-0.02	(0.01)	-0.02	(0.01)
SMRATIO	-0.02	(0.01)	1.57	(1.65)	1.9	(1.79)
TCSHORT	1.74	(1.68)	-0.51	(1.89)	-2.21	(1.87)
TCFOCST	0.11	(1.69)	-2.85	(7.69)	2.6	(8.67)
TCM_STUASS	-1.76	(7.11)	-5.6	(5.31)	-5.44	(5.44)
TCM_PEER	-5.45	(5.43)	-2.81	(2.61)	-3.11	(2.63)
TCH_INCENTV	-2.87	(2.24)	-26.99	(8.39)	-22.58	(10.55)
ASS_PROG	-16.88	(7.84)	9.49	(5.81)	10.84	(6.39)
ASS_PROM	11.54	(5.48)	0.75	(7.16)	3.85	(7.24)
ASS_SCH	1.29	(7.39)	3.62	(5.20)	4.24	(4.91)
STU_FEEDB	2.23	(4.57)	0.74	(13.38)	12.2	(14.08)
COMP_USE	-0.42	(4.95)	-0.08	(4.83)	0.25	(5.42)
TXT_BOOK	-7.54	(6.21)	-8.33	(7.15)	-9.08	(6.99)
TOWN	-6.23	(3.28)	-6.21	(3.42)	-8.65	(4.06)
CLSIZE	0.68	(0.21)	0.72	(0.23)	0.72	(0.24)
COMPWEB	12.71	(5.76)	14.02	(5.97)	13.84	(6.70)
SCMATEDU	4.62	(2.67)	4.5	(2.73)	6.5	(3.01)
SCMATBUI	3.16	(2.21)	2.57	(2.26)	2.41	(2.52)
EXC2_PLAY	6	(3.70)	6.44	(4.01)	8.62	(3.69)
EXC6_MATHCOMP	-1.66	(4.86)	-2.29	(5.13)	-4.09	(5.29)
EXC10_SPORT	-4.92	(9.03)	-6.91	(8.23)	-8.72	(9.22)
EXC11_UNICORN	6.99	(4.79)	6.91	(5.63)	6.68	(5.95)
SCL_EXTR_CL	11.36	(4.95)	8.3	(4.75)	6.21	(5.08)
SCORE_PUBLIC	11.12	(4.26)	8.71	(4.57)	10.62	(4.82)
QUAL_RECORD	11.35	(6.32)	10.14	(6.72)	5.45	(7.03)
SCHSEL	1.84	(2.96)	3.92	(3.22)	1.94	(3.53)
MATWKETH	-9.72	(1.58)	-	-	-	-
INSTMOT	5.66	(1.31)	-	-	-	-
INTMAT	-3.52	(1.90)	-	-	-	-
SUBNORM	-12.19	(0.88)	-	-	-	-
MATHEFF	29.91	(2.06)	-	-	-	-
MATINTFC	8.42	(0.86)	-	-	-	-
PERSEV	4.44	(1.10)	-	-	-	-
OUTMATH	-	-	1.73	(0.43)	-	-
EXPUREM	-	-	11.88	(0.99)	-	-
FAMCONC	-	-	24.1	(1.46)	-	-
BKGR_FAMPROB	-	-	-	-	0	(1.72)
ANXMAT	-	-	-	-	-18.57	(1.55)
ATSCHL	-	-	-	-	2.52	(1.09)
ATTLNACT	-	-	-	-	0.04	(1.20)
MTSUP	-	-	-	-	4.47	(1.13)
STUDREL	-	-	-	-	-6.86	(1.20)
TCHQUAL_DIFF	-	-	-	-	-9.97	(2.02)
TCHBEHTD	-	-	-	-	5.44	(1.27)
TCHBEHSO	-	-	-	-	-13.25	(1.44)
TCHBEHFA	-	-	-	-	0.02	(1.71)
DISCLIMA	-	-	-	-	1.28	(1.20)
R^2	49.87		49.36		48.24	
N	15775		14855		15539	

Notes: The sample consists of the 'Developing 7' countries and Vietnam. Column (1) contains in addition to all non-rotated variables, relevant variables from the student rotated questionnaire 1; column (2) contains in addition relevant variables from the student rotated questionnaire 2; column (3) contains additional relevant variables from the student rotated questionnaire 3.

Table A3: The estimated impact of 'Vietnam' on Reading PISA test scores - including rotated questionnaire variables

	Reading					
Variables	(6)		(7)		(8)	
VIETNAM	58.79	(6.04)	54	(5.99)	52.71	(6.24)
FEMALE	24.27	(1.97)	21.26	(1.92)	21.67	(1.91)
PRESCHOOL	24.98	(3.39)	22.17	(4.10)	21.32	(3.91)
REPEAT	-39.47	(3.39)	-42.47	(4.35)	-39.51	(3.70)
ST08Q01	-5.81	(1.52)	-6.21	(1.97)	-5.96	(1.55)
ST115Q01	-7.86	(1.85)	-10.93	(2.34)	-7.17	(2.12)
BOOK_N	0.05	(0.01)	0.04	(0.01)	0.05	(0.01)
PARPRESSURE	2.11	(4.08)	2.74	(4.49)	2.98	(4.19)
VOLUMOM	-0.02	(0.06)	-0.02	(0.07)	0	(0.06)
FUNDMOM	0.11	(0.06)	0.08	(0.06)	0.1	(0.06)
COUNCILMOM	-0.09	(0.07)	-0.05	(0.08)	-0.12	(0.07)
DUTYMOM	-0.1	(0.07)	-0.11	(0.08)	-0.11	(0.07)
PROPCERT	1.74	(5.59)	-0.31	(6.15)	4.75	(5.78)
TCSHORT	0.39	(1.91)	0.26	(2.00)	-0.33	(1.82)
TCM_STUASS	8.04	(8.83)	4.12	(9.23)	8.21	(8.48)
ASS_PROG	-10.75	(12.85)	-26.6	(11.36)	-10	(11.86)
ASS_PROM	14.11	(6.00)	11.43	(5.84)	11.08	(5.95)
ASS_NAT	1.55	(5.69)	-0.29	(6.62)	1	(6.12)
ASS_CUR	-3.68	(9.13)	-4.42	(9.30)	-0.93	(8.94)
STU_FEEDB	6.93	(4.28)	7.18	(4.53)	5.12	(4.36)
PCGIRLS	19.14	(10.42)	19.64	(11.99)	25.36	(11.56)
TOWN	-6.02	(3.64)	-7.8	(3.87)	-6.64	(3.87)
CLSIZE	0.99	(0.23)	0.64	(0.27)	0.87	(0.22)
COMPWEB	14.56	(5.55)	18.01	(5.78)	15.56	(6.03)
SCMATEDU	4.47	(2.59)	4.8	(2.59)	5.1	(2.52)
SCMATBUI	1.29	(2.46)	1.37	(2.54)	0.66	(2.36)
EXC2_PLAY	13.31	(4.05)	10.01	(4.28)	13.29	(3.97)
EXC6_MATHCOMP	7.9	(5.08)	9.79	(5.23)	6.18	(5.14)
EXC10_SPORT	-3.61	(11.66)	-3.21	(11.21)	-9.26	(11.30)
EXC11_UNICORN	11.6	(4.98)	12.75	(5.69)	10.12	(5.61)
SCORE_PUBLIC	4.61	(4.01)	4.69	(4.67)	5.39	(4.22)
LEADINST	1.12	(1.97)	1.87	(2.03)	2.16	(2.05)
QUAL_RECORD	-6.87	(6.93)	-9.79	(7.68)	-6.42	(7.04)
SCHSEL	1.26	(2.96)	-0.05	(3.21)	1.42	(3.26)
TEACCLIM	-1.98	(2.66)	-1.15	(2.68)	-1.68	(2.68)
PERSEV	7.81	(1.16)	-	-	-	-
LHRS	-	-	0.27	(0.60)	-	-
ST72Q01	-	-	0.78	(0.22)	-	-
BKGR_FAMPROB	-	-	-	-	-7.05	(1.87)
ATSCHL	-	-	-	-	10.16	(1.10)
ATTLNACT	-	-	-	-	-0.38	(1.13)
STUDREL	-	-	-	-	-6.85	(1.07)
TCHQUAL_DIFF	-	-	-	-	-13.42	(1.94)
R^2	42.84		40.35		43.8	
N	17611		14226		16891	

Notes: Column (6) contains in addition to all non-rotated variables, relevant variables from the student rotated questionnaire 1; column (7) contains in addition relevant variables from the student rotated questionnaire 2; column (8) contains additional relevant variables from the student rotated questionnaire 3.

Table A4: The estimated impact of 'Vietnam' on Science PISA test scores - including rotated questionnaire variables

	Science					
Variables	(6)		(7)		(8)	
VIETNAM	85.08	(5.86)	86.52	(6.02)	81.36	(6.25)
FEMALE	-5.19	(1.72)	-4.59	(2.00)	-5.05	(2.02)
PRESCHOOL	25.31	(3.59)	22.06	(3.78)	21.91	(4.08)
REPEAT	-37.2	(3.39)	-39	(4.13)	-38.24	(3.67)
ST08Q01	-7.32	(1.29)	-9.15	(1.69)	-6.82	(1.53)
ST115Q01	-6.12	(1.64)	-6.73	(2.47)	-5.21	(2.22)
BOOK_N	0.06	(0.01)	0.05	(0.01)	0.06	(0.01)
PARPRESSURE	-2.07	(3.68)	-0.44	(3.93)	-0.73	(3.85)
TCM_PEER	-4.82	(5.86)	-7.12	(6.45)	-4.57	(5.88)
FUNDMOM	0.17	(0.06)	0.16	(0.06)	0.18	(0.06)
COUNCILMOM	-0.13	(0.06)	-0.12	(0.07)	-0.12	(0.06)
DUTYMOM	-0.06	(0.06)	-0.07	(0.07)	-0.07	(0.07)
PROPCERT	4.16	(5.52)	0.5	(5.81)	7.14	(5.73)
TCSHORT	2.82	(1.83)	2.73	(2.01)	1.95	(1.75)
TCM_STUASS	10.18	(7.90)	8.56	(7.58)	10.83	(8.10)
ASS_PROG	-20.92	(10.54)	-29.01	(8.53)	-18.63	(11.39)
ASS_PROM	13.29	(6.96)	10.9	(6.97)	12.28	(7.36)
ASS_NAT	2.14	(4.83)	0.03	(5.48)	1.54	(5.27)
ASS_SCH	0.6	(6.69)	-0.41	(7.27)	0.78	(7.29)
ASS_CUR	-3.81	(8.41)	0.38	(9.39)	-3.36	(8.31)
STU_FEEDB	6.09	(4.59)	4.95	(4.96)	5.48	(4.84)
PCGIRLS	17.24	(10.75)	18.27	(12.05)	21.29	(12.04)
PRIVATESCL	-0.94	(5.36)	-3.85	(5.84)	0	(5.74)
TOWN	-7.2	(3.20)	-7.95	(3.18)	-8.26	(3.39)
CLSIZE	0.88	(0.20)	0.87	(0.21)	0.74	(0.20)
COMPWEB	15.23	(5.64)	19.29	(5.64)	15.83	(6.22)
SCMATEDU	5.52	(1.82)	4.69	(1.73)	5.42	(1.93)
EXC2_PLAY	8.82	(3.31)	8.09	(3.70)	9.23	(3.49)
EXC6_MATHCOMP	2.4	(4.48)	0.24	(4.84)	-0.55	(4.84)
EXC10_SPORT	-1.63	(9.83)	-2.83	(8.14)	-4.44	(10.17)
EXC11_UNICORN	8.52	(5.04)	10.1	(5.36)	8.29	(5.67)
SCORE_PUBLIC	10.85	(3.74)	11.05	(4.29)	11.28	(3.88)
LEADINST	1.29	(1.89)	2	(2.01)	1.92	(1.95)
QUAL_RECORD	-1.4	(5.51)	-0.25	(5.70)	-1.29	(5.80)
SCHSEL	1.49	(3.08)	2.69	(3.28)	0.86	(3.33)
TEACCLIM	-2.05	(2.42)	-1.5	(2.62)	-2.73	(2.47)
PERSEV	7.84	(1.03)	-	-	-	-
OUTSCIE	-	-	2.73	(0.56)	-	-
BKGR_FAMPROB	-	-	-	-	-7.57	(1.59)
ATSCHL	-	-	-	-	6.72	(1.02)
ATTLNACT	-	-	-	-	-0.31	(1.21)
STUDREL	-	-	-	-	-6.16	(0.94)
TCHQUAL_DIFF	-	-	-	-	-16.34	(1.86)
R2	47.74		47.96		49.34	
N	17545		15960		16826	

Notes: Column (6) contains in addition to all non-rotated variables, relevant variables from the student rotated questionnaire 1; column (7) contains in addition relevant variables from the student rotated questionnaire 2; column (8) contains additional relevant variables from the student rotated questionnaire 3.

Table A5: Variable overview - students variables

Variable	Description	Questionnaire	Question reference
STUDENTS			
Student characteristics and family background (Table 1)			
FEMALE	Sex of student	Student - general quest.	ST04Q01
AGE	Age of student	Student - general quest.	OECD index
PRESCHOOL	Attend Preschool (ISCED 0)	Student - general quest.	ST05Q01
REPEAT	Grade repeating	Student - general quest.	OECD index
ST08Q01/LATESCHOOL	Times late for school	Student - general quest.	ST08Q01
ST09Q01	Days unexcused absence	Student - general quest.	ST09Q01
ST115Q01	Times skipped classes	Student - general quest.	ST115Q01
HISEI	Highest parental occupational status	Student - general quest.	OECD index
MISCED	Educational level of mother (ISCED)	Student - general quest.	OECD index
WEALTH	Family wealth possessions	Student - general quest.	OECD index
CULTPOS	Cultural possessions	Student - general quest.	OECD index
HEDRES	Home educational resources	Student - general quest.	OECD index
BOOK_N	Number of books in family home	Student - general quest.	OECD index
Student effort (Table 2)			
OUTMATH	weekly out-of-school lessons in math	Student - rotated quest. 2	ST55Q02
OUTREAD	weekly out-of-school lessons in 'test language'	Student - rotated quest. 2	ST55Q01
OUTSCIE	weekly out-of-school lessons in science	Student - rotated quest. 2	ST55Q03
ST57Q01	Out-of-school-time homework	Student - rotated quest. 2	ST57Q01
ST57Q02	Out-of-school-time guided homework	Student - rotated quest. 2	ST57Q02
ST57Q03	Out-of-school-time personal tutor	Student - rotated quest. 2	ST57Q03
ST57Q04	Out-of-school-time classes by company	Student - rotated quest. 2	ST57Q04
ST57Q05	Out-of-school-time parent/family member	Student - rotated quest. 2	ST57Q05
ST57Q06	Out-of-school-time learn on computer	Student - rotated quest. 2	ST57Q06
Student attitude (Table 3)			
MATWKETH	Mathematics work ethic	Student - rotated quest. 1	OECD index
SUBNORM	Subjective norms in mathematics	Student - rotated quest. 1	OECD index
OPENPS	Openness to problem solving	Student - rotated quest. 1	OECD index
SCMAT	Self-Concept of own math skills	Student - rotated quest. 3	OECD index
PERSEV	Perseverance in problem solving	Student - rotated quest. 1	OECD index
ANXMAT	Mathematics anxiety	Student - rotated quest. 3	OECD index
MATINTFC	Mathematics intentions	Student - rotated quest. 1	OECD index
Student experience in mathematics (Table 4)			
FAMCON	Familiarity with math concepts	Student - rotated quest. 2	OECD index
FAMCONC	FAMCON corrected with FOIL	Student - rotated quest. 2	OECD index
EXAPPLM	Experience with applied mathematics tasks at school	Student - rotated quest. 2	OECD index
EXPUREM	Experience with pure mathematics tasks at school	Student - rotated quest. 2	OECD index
Additional student variables used in regressions/decomposition (Table 13, 14, 15, A2, A3, A4)			
NOREPEAT	1 - REPEAT	Student - general quest.	based on 'REPEAT' OECD index
SHRS	Learning time (hours per week) in science	Student - rotated quest. 2	based on 'SMINS' OECD index
LHRS	Learning time (hours per week) in 'test language'	Student - rotated quest. 2	based on 'LMINS' OECD index
MHRS	Learning time (hours per week) in mathematics	Student - rotated quest. 2	based on 'MMINS' OECD index
ATSCHL	Attitudes towards school - learning is useful	Student - rotated quest. 3	OECD index
ATTLNACT	Attitudes towards school - studying pays off	Student - rotated quest. 3	OECD index
BKGR_FAMPROB	Problems at home deter effort in school	Student - rotated quest. 3	ST91Q03
ST72Q01	Class size in 'test language'	Student - rotated quest. 3	ST72Q01

Notes: For details on OECD indices, please see the PISA 2012 Technical Report [OECD, 2014a].

Table A6: Variable overview - parents and teachers variables

Variable	Description	Questionnaire	Question reference
PARENTS			
Parental support at school (Table 5)			
PARPRESSURE	Parental achievement pressure	School questionnaire	SC24Q01
TIGERMOM	Parent initiates - progress discussion	School questionnaire	SC25Q01, SC25Q03
DUTYMOM	Teacher initiates - progress discussion	School questionnaire	SC25Q02, SC25Q04
VOLUMOM	Parent participation - volunteering	School questionnaire	SC25Q05, SC25Q06, SC25Q07, SC25Q09, SC25Q12
TEACHMOM	Parent participation - teaching assistance	School questionnaire	SC25Q08
FUNDMOM	Parent participation - fundraising	School questionnaire	SC25Q11
COUNCILMOM	Parent participation - school government	School questionnaire	SC25Q10
TEACHERS			
Teacher characteristics and management (Table 6)			
PROPCERT	Proportion of certified teachers	School questionnaire	OECD index
SMRATIO	Mathematics teacher-student ratio	School questionnaire	OECD index
SC35Q02/MATHPROFDEV	Professional development in math in last 3 months	School questionnaire	SC35Q02
STUDREL	Teacher student relations	Student - rotated quest. 3	OECD index
TCH_INCENTV	Teacher appraisal linked to incentives	School questionnaire	IRT index from SC31Q01-Q07
TCH_MENT	Teacher mentoring as quality assurance	School questionnaire	SC39Q08
TCM_PEER	Teacher peer review of elctures, methods etc	School questionnaire	SC30Q02
TCM_OBSER	Principal or senior staff observations	School questionnaire	SC30Q03
TCM_INSPE	Observation of classes external inspector	School questionnaire	SC30Q04
Pedagogical practices (Table 7)			
COMP_USE	Math policy - use of computers in class	School questionnaire	SC40Q01
TXT_BOOK	Math policy - same textbook	School questionnaire	SC40Q02
STD_CUR	Maths policy - standardized curriculum	School questionnaire	SC40Q03
ASS_SCH	Formative assessment used to monitor the schools yearly progress	School questionnaire	SC18Q05
ASS_TCH	Formative assessment used to make judgements on teachers effectiveness	School questionnaire	SC18Q06
COGACT	cognitive activation in mathematics lessons	Student - rotated quest. 3	OECD index
STU_FEEDB	Seeking written feedback from students	School questionnaire	SC39Q07
CLSMAN	Teacher classroom management (in math)	Student - rotated quest. 3	OECD index
DISCLIMA	Disciplinary climate in class (in math)	Student - rotated quest. 3	OECD index
Additional teacher variables used in regressions/decomposition (Table 10, 11, 12, 13, 14, 15, A2, A3, A4)			
Formative assessment used to			
ASS_PROG	inform parents about childs progress	School questionnaire	SC18Q01
ASS_PROM	decide on students retention or promotion	School questionnaire	SC18Q02
ASS_NAT	compare school to national performance	School questionnaire	SC18Q04
ASS_CUR	identify improvements in the curriculum	School questionnaire	SC18Q07
TCHBEHFA	help student perform better	Student - rotated quest. 3	OECD index

Notes: For details on OECD indices, please see the PISA 2012 Technical Report [OECD, 2014a].The same IRT approach was used to construct the TCH_INCENTV index.

Table A7: Variable overview - teachers variables continued, schools variables

Variable	Description	Questionnaire	Question reference
TEACHERS cntd.			
Additional teacher variables used in regressions/decomposition (Table 10, 11, 12, 13, 14, 15, A2, A3, A4)			
TCSHORT	Shortage of teaching staff	School questionnaire	OECD index
TCFOCST	Teacher focus	School questionnaire	OECD index
TCM_STUASS	Test or assessment of student achievement	School questionnaire	SC30Q01
TCMORALE	Teacher morale	School questionnaire	OECD index
TCHQUAL_DIFF	different teacher student would work harder	Student - rotated quest. 3	ST91Q04
MTSUP	Mathematics supportive teaching style	Student - rotated quest. 3	OECD index
TCHBEHTD	Teacher oriented instruction method	Student - rotated quest. 3	OECD index
TCHBEHSO	Student oriented instruction method	Student - rotated quest. 3	OECD index
SCHOOLS			
School characteristics (Table 8)			
PRIVATESCL	Private school dummy variable	School questionnaire	SC01Q01
SC02Q02/STU_FEES	Funding from school from student fees	School questionnaire	SC02Q02
VILLAGE	School located in a village	School questionnaire	SC03Q01
TOWN	School located in a town	School questionnaire	SC03Q01
CITY	School located in a city	School questionnaire	SC03Q01
CLSIZE	Average class size	School questionnaire	OECD index
SCHSIZE	Number of enrolled students at school	School questionnaire	OECD index
PCGIRLS	Proportion of girls at school	School questionnaire	OECD index
School resources and management (Table 9)			
RATCMP15	Available computers for 15-year-olds	School questionnaire	OECD index
COMPWEB	Ratio of computers connected to internet	School questionnaire	OECD index
SCMATEDU	Quality of school educational resources]	School questionnaire	OECD index
SCMATBUI	Quality of physical infrastructure	School questionnaire	OECD index
SCL_EXTRA_CL	School offers additional math classes	School questionnaire	SC20Q01
EXC1_BAND	School offers band, orchstra or choir	School questionnaire	SC16Q01
EXC2_PLAY	School offers school play/musical	School questionnaire	SC16Q02
EXC5_MCLUB	School offers mathematics club	School questionnaire	SC16Q05
EXC6_MATHCOMP	School offers mathematics competition	School questionnaire	SC16Q06
EXC10_SPORT	School offers sporting activities	School questionnaire	SC16Q10
SCORE_PUBLIC	Achievement data posted publicly	School questionnaire	SC19Q01
SCORE_AUTHRITS	Achievement data tracked by authority	School questionnaire	SC19Q02
SCHAUTON	School autonomy in admininistrative decisions	School questionnaire	OECD index
TCHPARTI	Teacher participation in administrative decisions	School questionnaire	OECD index
LEADCOM	Communicating and acting on defined school goals	School questionnaire	OECD index
STUDCLIM	Student-related aspects of school climate	School questionnaire	OECD index
TEACCLIM	Teacher-related aspects of school climate	School questionnaire	OECD index
Additional school variables used in regressions/decomposition (Table 10, 11, 12, 13, 14, 15)			
EXC11_UNICORN	School offers 'country specific item'	School questionnaire	SC16Q11
LEADINST	Promotion of instructional leadership	School questionnaire	OECD index
QUAL_RECORD	Systematic recording of data for quality assurance	School questionnaire	SC39Q03
SCHSEL	School selectivity/student admission policies	School questionnaire	OECD index

Notes: For details on OECD indices, please see the PISA 2012 Technical Report [OECD, 2014a].

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