**Who tend to overclaim in the PISA student background questionnaire?**

# **Perspectives and Theoretical Framework**

* Overclaiming [bias] exists in surveys [self-report may not be very reliable, could cause threat to validity]
  + Self-report is used a lot in surveys
  + ILSA is not exception
    - Studies like to link students’ response to outcomes (cite xx, xx, and xx)
  + However, research points out that self-report (without adjustment) may be a problem
    - Social desirably tendency [Students may have a tendency in report response]
    - Exaggerate, overclaim
* Taking self-report at face value is a problem
  + It causes the Attitude-achivement anomaly
  + Studies are used for refrenceing education policy
* There are some efforts to alleviate that problem by methods such as xxx, xxx, and xxx
* In PISA, overclaiming technique questionnaires is introduced, but has not got too much attention
  + No study looked at the overclaim items
  + No study looked at students who tend to overclaim
  + Knowledge about above could help understand students’ behavior better, they also remind us the importance of carefully interpreting students’ self-report.
    - These findings are important for increasing the quality of data obtainable from ILSA quesitonnaires, and may be even more generally useful in addressing cross-cultural (Bartram 2013) and even cross-sub-group (Mickelson 1990) comparability issues. – Bertling 2014

# **Objectives**

[place holder]

\* it is important to take into account student’s response patterns when interpreting the results (espeically in a post-fact era)

\* identify subgroups who tend to over claim

# **Perspectives and Theoretical Framework**

Self-reported Likert scale is commonly used in social science research to understand participants’ attitude or belief in the topic of interest.[[1]](#footnote-1) It is of no exception in large-scale international studies, such as the Program for International Student Assessment (PISA), and the Trends in International Mathematics and Science Study (TIMSS). These large-scale international studies provide not only students’ assessment data on various subjects, but also responses to a series of self-reported Likert scale background questionnaires from students, parents, teachers, and school principals. The relationship between the assessment data and the background questionnaire data are explored in many cross-cultural research[[2]](#footnote-2).

However, literature points out many problems facing self-reported Likert scale data[[3]](#footnote-3). Social desirability bias is one of the problems, as participants tend to choose answers that are viewed as desirable by society at large[[4]](#footnote-4). There are also evidence of individuals overstating the levels of traits that they themselves see as desirable[[5]](#footnote-5). In making cross-cultural comparisons based on self-reported data, such problems become more pronounced as differences in responses to the background questionnaires Likert scale may be in part due to differences in response styles across gender[[6]](#footnote-6), race[[7]](#footnote-7), socioeconomic status[[8]](#footnote-8), and cultures in general.[[9]](#footnote-9) For example, research found that that Chinese and Japanese secondary students are more likely to use the midpoint of a seven- point Likert-type item, while U.S. students exhibit a greater tendency toward extreme response style than the Asian students or their Canadian counterparts. [[10]](#footnote-10) Therefore, interpreting responses to background questionnaires at face value would cause validity threats to the research results, which would then incorrectly inform education policy.

Efforts to address these problems include methods such as anchoring vignettes[[11]](#footnote-11), forced-choice comparisons[[12]](#footnote-12), situational-judgement-test, behavioral items, bi-factor models[[13]](#footnote-13), and the overclaiming technique[[14]](#footnote-14). They all help alleviate the comparability issue, although there is no consensus among the limited literature on which method is the best.[[15]](#footnote-15) The overclaiming technique was used in PISA 2012 as one way to enable adjustments for cross-cultural differences in response tendencies[[16]](#footnote-16). However, it has not received much research attention. No previous studies have examined the overclaiming questions at the item-level, nor have they identified subgroups who tend to overclaim. This analysis aims at filling these gaps by comparing – in a global context – students’ responses to the overclaiming questions.

# **Methods and Data Sources**

PISA is coordinated by the Organization for Economic Cooperation and Development (OECD). This analysis uses PISA 2012 mathematics assessment data and links the assessment data to data from the PISA student background questionnaire, which asked students about their familiarity with mathematical concepts. There are 13 actual mathematical concepts such as “exponential function”, “complex number”, and “polygon” (see appendix A). In addition, there are 3 non-existing (i.e. foil) concepts designed to detect overclaiming: “proper number”, “subjunctive scaling”, and “declarative fraction”. Foils were created by combining a term from grammar (i.e. proper, as in proper noun; subjunctive, as in subjunctive mood; declarative as in declarative sentence) with a mathematical term (i.e. number; scaling; fraction, respectively).[[17]](#footnote-17)

The response options for both the real concepts and the foils are the same: (a) never heard of it, (b) heard of it once or twice, (c) heard of it a few times, (d) heard of it often, and (e) know it well, understand the concept, which takes the value from 1 to 5, respectively. This analysis calculates three indexes from students’ responses. The first index (REAL\_MEAN) is a simple mean score of students’ responses to the 13 real mathematical concepts. The second index (FOIL\_MEAN) is the mean score of students’ responses to the 3 foil concepts. The last index (REAL\_MEAN\_ADJUSTED) is the difference between the first index and the second index, which is a conventional way of correcting overclaiming[[18]](#footnote-18).

Based on students’ score of the first two indexes, this analysis identifies students in each education system who fits into one of the following four groups.

Table 1. xxxxx

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | **REAL\_MEAN** | |
|  |  |  | **Bottom quartile** | **Top quartile** |
|  |  |  | (students whose average response is closer to "never heard of it" in a given education system) | (students whose average response is closer to "know it well, understand the concept" in a given education system) |
| **FOIL\_MEAN** | **Top quartile** | (students whose average response is closer to "know it well, understand the concept" in a given education system) | **Irrational respondents** | **Over claimers** |
| **Bottom quartile** | (students whose average response is closer to "never heard of it" in a given education system) | **Low claimers** | **Ideal respondents** |

The analysis also uses an index variable, the Economic, Social and Cultural Status Index (ESCS), as a proxy for students’ socioeconomic background. The ESCS index is derived from the following variables administered in the PISA student background questionnaire: highest occupational status of parents; highest educational level of parents, in years of education, as defined by the International Standard Classification of Education (ISCED); and students’ home possessions. Home possessions include cultural items, such as books of classic literature and poetry, textbooks, and artwork, and whether students have a room of their own, a computer they can use for school, and educational software.

Results are presented at the education system level for the United States and XX other education systems around the world[[19]](#footnote-19). Two-tailed t-tests were performed for comparisons of xxx percentages and mathematics performance. Test results with p-values under 0.05 are considered statistically significant.

# **Results and Conclusions**

**Q1: How do students responded to real and foil mathematical concepts? (Does overclaiming exist among PISA participating education systems?)**

* Although students’ response to each of the 16 math familiarity items varies, there are general trends to how students responded to real mathematical concepts versus the foil ones[[20]](#footnote-20). Figure 1 illustrates students’ responses on their familiarity with an example real concept, “exponential function” to the left, and a foil item, “proper number” to the right.
* Across the 64 PISA participating education systems, the percentage of students who reported that they had never heard of the real concept “exponential function” ranged from 8% in Chinese Taipei to 80% in Tunisia. In the United States, 14% of the students falls into this category.
* When presented with the foil item, “proper number”, it would be expected that the majority of the students would report “never heard of it”. This is the case in 5 education systems where more than half of the students reported this way: Iceland, Spain, Korea, and Chinese Taipei, and Hong Kong – China. However, the percentage of students who chose “never heard of it” ranged from 73% in Iceland to 3% in Albania. In the United States, 15% of the students reported that they have never heard of the pseudo-concept.
* This is a clear indication of the existence of the overclaiming effect among PISA participating students. Given that students tend to overclaim (with varying degrees across education systems), interpreting students’ familiarity with real mathematical concepts without any adjustment would be misleading.

**Q2: Could overclaiming be adjusted?**

* Across the 64 education systems, on average, students indicated a 3.4 familiarity rating for the real mathematics concepts (REAL\_MEAN), and a 2.3 familiarly rating for the foils (FOIL\_MEAN). The average mathematic performance for these 64 education systems are 474 out of the 1000.
* It is expected that students’ math familiarity rating would be positively correlated with their mathematics performance.
* The average within-education-system correlations between the familiarity ratings and math achievement are r = 0.46 and r = 0.43 for the unadjusted (REAL\_MEAN) and adjusted (REAL\_MEAN\_ADJUSTED) ratings, respectively. That is, they were essentially the same.
* However, the differences brought by the adjustment are striking at the across-education-system level. Before adjustment, there is a very weak relationship (r = 0.16) between students’ familiarity and math performances across all education systems. Although there may be a substantive explanation for having such a weak relationship at across-education-system level but not at the within-education-system level, it is more reasonable to believe that the across-education-system level correlation of r=0.16 includes bias brought by different response style across education systems. After adjustment, the correlation increases to r = 0.68, which is in line with what the findings from the field test of PISA 2012[[21]](#footnote-21).

**Q3: Which subgroup of students tended to overclaim?**

* Based on students’ average response to the real concepts and the foil ones, this analysis identifies 4 types of students in each education system: low claimers, irrational respondents, ideal respondents, and over claimers. [Figure 2] Across 64 educaiton systems, the percentage of over claimers ranged from 8% in Korea and Spain to 18% in Sweden. In the United States, 12% of the students are identified as over claimers. There is no obvious association between the concentration of over claimers and the geographic location or math performance of an education system.
* [Figure 2-a] Depending on the education system, there may be a gender gap in the percentage of over claimers. In the United States, for example, 11% of girls are over claimers, while 12% of boys are the same. The gender gap is not statistically significant in this case. In 31 education systems, however, there are higher percentage of boys than girls who are over claimers. In 3 education systems, higher percentage of girls than boys are identified as over claimers.
* [Figure 2-b] (??)

**Q4: What are the outcomes overclaiming familiarity of mathematical concepts?**

* Across the 64 education systems, it is the general trend that the over claimers scored lower than the ideal respondents, but higher than either the low claimers or the irrational respondents in mathematics, science, and reading performance.
* The math performance for over claimers range from 386 in Indonesia to 639 in Shanghai – China. In the United States, over claimers have an average math score of 516.
* [regression?]
* [other outcomes such as anxiety?]
* **Correlation between math achievement and familiarity measures**
  + Field Trial and initial Main Survey analyses (Bertling and Roberts, 2011) showed increased cross-cultural comparability of correlations with achievement for the adjusted compared to the unadjusted index
  + Jasmine: As Markus mentioned, one of the NAEP Validity Panel research studies I’ve been doing (Computer Familiarity and Access Study), also used “overclaiming” items to adjust students’ response on the confidence items. What we found is that if we adjust students’ confidence level (Students’ confidence level on the “real concepts”-students’ confidence level on the “pseudo concepts”, overclaiming), the predictive power of students’ confidence for predicting achievement is much higher.

# **Appendix**

Secondary analysts of these attitudinal data, however, generally ignore the issue of cultural differences in response style or scale usage heterogeneity, leading to descriptive statistics and inferences that may be biased and misleading. In this paper I explore this issue several ways and illustrate the extent, consequences, and some possible solutions using data from PISA 2006.[[22]](#footnote-22)

Secondary analysts who use attitudinal data from international education assessments are at risk of reaching erroneous conclusions if they do not consider the issue of cultural differences in survey response style.[[23]](#footnote-23)

Although individual respondents' idiosyncratic usage of different response styles adds noise to attitude survey data, systematic differences in response style across nations or cultures can introduce far more serious biases in both descriptive statistics and inferential results from more complex models. Unfortunately, there is much empirical evidence of such systematic biases between cultures. (Javaras and Ripley 2007; King, Murray, Salomon, and Tandon 2004; Johnson 2003; Rossi, Gilula, and Allenby 2001; Baumgartner and Steenkamp 2001; Heine, Takata, and Lehman 2000; de Vijver and Leung 1997; Chen, Lee, and Stevenson 1995; Mullen 1995; Greenleaf 1992; Poortinga 1989).[[24]](#footnote-24)

These findings, particularly the cross-national research on secondary school populations, suggest that heterogeneity in response style could be a potential source of bias in the secondary analysis of PISA and other international assessment data. In this paper I investigate the extent, form, and consequences of cross-cultural differences in response style or scale usage using data from the PISA 2006 student questionnaire and science assessment (OECD 2007).[[25]](#footnote-25)

Public schools are widely assumed to perform less well than private schools for a number of reasons, such as less competition in the market (Cordero, Prior, & Simancas, 2016; Chubb & Moe, 1990; Hoxby, 2003). Thus, when comparing the performance of public and private school students, the existing literature has pointed to the importance of controlling for confounding factors that are associated both with the type of school that students attend and their performance (Mayston, 2003; Tamm, 2008; Burgess & Briggs, 2010). One such confounding factor is students’ socioeconomic background (Duncan & Sandy, 2007).

The existing literature reveals mixed findings on this topic. After controlling for confounding factors (including students’ socioeconomic background), some studies find that performance gaps become statistically insignificant (Williams & Carpenter, 1991; Hsieh & Urquiola, 2006), some find that gaps still favor private school students (Jimenez, Lockheed, & Paqueo, 1991; Toma, 1996; Dronkers & Avram, 2010), and others find that public school students outperform their private school peers (Bifulco & Ladd, 2006; Newhouse & Beegle, 2006).

Cross-national studies such as PISA also consistently suggest mixed findings at the education system level. In 2015, across most PISA-participating education systems, 15-year-old students (PISA’s target population) enrolled in public schools scored lower in the PISA core subjects (mathematics, reading, and science) than students in private schools. However, after accounting for socioeconomic background, depending on the education system, the performance gaps in the PISA core subjects disappeared, still favored private school students, or favored public school students. (OECD, 2010; OECD, 2013; OECD, 2016).

Financial literacy is now globally recognized as an essential life skill. It is believed that an increase in financial literacy skills can improve financial decision making and thus positively impact not only individuals and households but also economic and financial stability more generally (OECD, 2017). In response, since 2012, PISA has included financial literacy as a measurement domain in addition to the core subjects of mathematics, reading, and science.

A review of the literature reveals that no previous studies have examined financial literacy performance gaps between public and private school students. Thus, using the latest PISA data (from the 2015 assessment), this paper aims to analyze 15-year-old students’ performance in financial literacy and explore whether these gaps are related to school type and socioeconomic background.

# **Results and Conclusions**

Structure

1. Which direction, or both?
   1. Who tend to overclaim?
      1. Research questions
         1. **Percentage of students’ response**
         2. **Math score (gap) by students’ response**
            1. Focus on “never heard of it” and “know it well, understand the concept”
            2. Recode into “never heard of it” and “heard of it”
         3. **score (gap) in other index by students’ response**
            1. Math self-concept
            2. Math self-affect
            3. Math anxiety
            4. Etc

YL: these index were derived using student background data, is that okay?

* + - 1. **Broken down by gender**
         1. Jasmine: We also saw some differences in “overclaiming” by subgroups within the NAEP sample, so I am not surprised to see differences across countries.
         2. YL: what’s the findings there? Could you share some literature?
      2. **Broken down by language at home?**
      3. **Broken down by students’ ESCS???**
      4. **Predicting the probability of overclaiming using some covariates (including math scores?)**
         1. Key independent able being math scores?
         2. What can it tell us?
      5. **Correlation within country, and across country?**
         1. Math self-concept and math interest showed the anomalous pattern of positive average-within-country correlations and negative country-level correlations, while some other index did not.
         2. Field Trial and initial Main Survey analyses (Bertling and Roberts, 2011) showed increased cross-cultural comparability of correlations with achievement for the adjusted compared to the unadjusted index

YL: I couldn’t find it, may be missing something

* 1. What would happen if we use the overclaim variables to adjust students’ response to similar items
     1. How to do it?
        1. Jasmine: As Markus mentioned, one of the NAEP Validity Panel research studies I’ve been doing (Computer Familiarity and Access Study), also used “overclaiming” items to adjust students’ response on the confidence items. What we found is that if we adjust students’ confidence level (Students’ confidence level on the “real concepts”-students’ confidence level on the “pseudo concepts”, overclaiming), the predictive power of students’ confidence for predicting achievement is much higher.

# **Objectives**

Comparing the United States with 12 other education systems that participated in the financial literacy assessment of the 2015 Program for International Student Assessment (PISA), this analysis looks at enrollment and performance gaps between public and private school students and explores factors that are associated with such gaps. In particular, this analysis examines (a) enrollment gaps between public and private school students across participating education systems, (b) gaps in financial literacy performance between public and private school students, and (c) the association between students’ socioeconomic background and these gaps.

# **Perspectives and Theoretical Framework**

Public schools are widely assumed to perform less well than private schools for a number of reasons, such as less competition in the market (Cordero, Prior, & Simancas, 2016; Chubb & Moe, 1990; Hoxby, 2003). Thus, when comparing the performance of public and private school students, the existing literature has pointed to the importance of controlling for confounding factors that are associated both with the type of school that students attend and their performance (Mayston, 2003; Tamm, 2008; Burgess & Briggs, 2010). One such confounding factor is students’ socioeconomic background (Duncan & Sandy, 2007).

The existing literature reveals mixed findings on this topic. After controlling for confounding factors (including students’ socioeconomic background), some studies find that performance gaps become statistically insignificant (Williams & Carpenter, 1991; Hsieh & Urquiola, 2006), some find that gaps still favor private school students (Jimenez, Lockheed, & Paqueo, 1991; Toma, 1996; Dronkers & Avram, 2010), and others find that public school students outperform their private school peers (Bifulco & Ladd, 2006; Newhouse & Beegle, 2006).

Cross-national studies such as PISA also consistently suggest mixed findings at the education system level. In 2015, across most PISA-participating education systems, 15-year-old students (PISA’s target population) enrolled in public schools scored lower in the PISA core subjects (mathematics, reading, and science) than students in private schools. However, after accounting for socioeconomic background, depending on the education system, the performance gaps in the PISA core subjects disappeared, still favored private school students, or favored public school students. (OECD, 2010; OECD, 2013; OECD, 2016).

Financial literacy is now globally recognized as an essential life skill. It is believed that an increase in financial literacy skills can improve financial decision making and thus positively impact not only individuals and households but also economic and financial stability more generally (OECD, 2017). In response, since 2012, PISA has included financial literacy as a measurement domain in addition to the core subjects of mathematics, reading, and science.

A review of the literature reveals that no previous studies have examined financial literacy performance gaps between public and private school students. Thus, using the latest PISA data (from the 2015 assessment), this paper aims to analyze 15-year-old students’ performance in financial literacy and explore whether these gaps are related to school type and socioeconomic background.

# **Methods and Data Sources**

PISA is coordinated by the Organization for Economic Cooperation and Development (OECD). The PISA financial literacy assessment tested students on their knowledge and understanding of fundamental elements of the financial world, including financial concepts, products, and risks, and their ability to apply what they know to real-life situations involving financial issues and decisions (Gonzales & Sen, 2017).

This analysis uses PISA 2015 financial literacy assessment data and links the assessment data to data from the PISA school background questionnaire, which collected school principals’ responses to two questions about school type. The first question was “Is your school a public or a private school?” and it had two response options: (a) “A public school”[[26]](#footnote-26) and (b) “A private school.”[[27]](#footnote-27) If the answer to this question was “A private school,” school principals were prompted to answer another question—“What kind of organization runs your school?”—with these response options: (a) “A church or other religious organization,” (b) “Another not-for-profit organization,” and (c) “A for-profit organization.”

The analysis also uses an index variable, the Economic, Social and Cultural Status Index (ESCS), as a proxy for students’ socioeconomic background. The ESCS index is derived from the following variables administered in the PISA student background questionnaire: highest occupational status of parents; highest educational level of parents, in years of education, as defined by the International Standard Classification of Education (ISCED); and students’ home possessions. Home possessions include cultural items, such as books of classic literature and poetry, textbooks, and artwork, and whether students have a room of their own, a computer they can use for school, and educational software.

Results are presented at the education system level for the United States and 12 other education systems around the world.[[28]](#footnote-28) Two-tailed t-tests were performed for comparisons of school enrollment percentages and financial literacy performance. Test results with p-values under 0.05 are considered statistically significant; results with p-values between 0.05 and 0.1 are considered marginally statistically significant.

# **Significance**

This analysis provides a cross-national picture of enrollment and financial literacy gaps between public and private school students and explores the association between such gaps and students’ socioeconomic background. The findings contribute to the existing literature by using the latest data from PISA (from the 2015 assessment) and by focusing on the financial literacy assessment. The results confirm previous research about the importance of students’ socioeconomic background in contributing to enrollment and performance gaps between public and private school students. Further research is invited to focus on the cause and the magnitude of such gaps.

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1. https://journals.lww.com/spinejournal/Fulltext/2000/12150/Guidelines\_for\_the\_Process\_of\_Cross\_Cultural.14.aspx [↑](#footnote-ref-1)
2. (e.g.

   Loveless 2007; Haahr, Nielsen, Hansen, and Nielsen 2005; Woessmann 2001) (from Buckely paper), note that I could probaby search for some different/newer papers of these authers [↑](#footnote-ref-2)
3. Buckley paper; Does the Over-Claiming Questionnaire Measure Overclaiming?; [↑](#footnote-ref-3)
4. Paulhus, 2002 (from the Does the Over-Claiming Questionnaire Measure Overclaiming?;) [↑](#footnote-ref-4)
5. (Ludeke, Weisberg, & DeYoung, 2013 (from the Does the Over-Claiming Questionnaire Measure Overclaiming?;) [↑](#footnote-ref-5)
6. Watkins, D. and S. Cheung (1995). From Buckley paper [↑](#footnote-ref-6)
7. Marin, Gamba, and Marin (1992) from Buckley paper; The Attitude-Achievement Paradox Among Black Adolescents [↑](#footnote-ref-7)
8. Bachman and O'Malley (1984) from buckley paper; Correlates of Respondent Accuracy in the Denver Validity Survey [↑](#footnote-ref-8)
9. Bertling 2014, Chen, Lee, and Stevenson (1995) from Buckely paper; also from the Buckley paper: Unfortunately, there is much empirical evidence of such systematic biases between cultures. (Javaras and Ripley 2007; King, Murray, Salomon, and Tandon 2004; Johnson 2003; Rossi, Gilula, and Allenby 2001; Baumgartner and Steenkamp 2001; Heine, Takata, and Lehman 2000; de Vijver and Leung 1997; Chen, Lee, and Stevenson 1995; Mullen 1995; Greenleaf 1992; Poortinga 1989) [↑](#footnote-ref-9)
10. Chen, Lee, and Stevenson (1995) from Buckely paper. [↑](#footnote-ref-10)
11. Cite something [↑](#footnote-ref-11)
12. Cite something [↑](#footnote-ref-12)
13. (e.g., Brown & Maydeu-Olivares, 2011; Cheung & Rensvold, 2000; Rutkowski et al., 2014) from Jia He paper [↑](#footnote-ref-13)
14. Cite something [or cite the whole sentence: bertleing 2014; OECD technical report?] (OCT; Paulhus, Harms, Bruce and Lysy, 2003; see also Zimmerman, Broder, Shaughnessy, and Underwood, 1977). From the 2012 tech report [↑](#footnote-ref-14)
15. Jia he paper [↑](#footnote-ref-15)
16. 2012 tech report [↑](#footnote-ref-16)
17. Tech report page 367 [↑](#footnote-ref-17)
18. (OCT; Paulhus, Harms, Bruce and Lysy, 2003; see also Zimmerman, Broder, Shaughnessy and Underwood, 1977) from tech report page 367 [↑](#footnote-ref-18)
19. Norway is kicked out for sure (no data for familiarly questions), nother countries remain watching [↑](#footnote-ref-19)
20. Students’ response for each item could be found in the appendix [↑](#footnote-ref-20)
21. Bertling 2014 page 283 (or PISA 2012 tech report) [↑](#footnote-ref-21)
22. buckley [↑](#footnote-ref-22)
23. buckley [↑](#footnote-ref-23)
24. buckley [↑](#footnote-ref-24)
25. buckley [↑](#footnote-ref-25)
26. A public school is defined by the OECD as “a school managed directly or indirectly by a public education authority, government agency, or governing board appointed by government or elected by public franchise.” [↑](#footnote-ref-26)
27. A private school is defined by the OECD as “a school managed directly or indirectly by a non-government organization; e.g. a church, trade union, business, or other private institution.” [↑](#footnote-ref-27)
28. The Flemish Community of Belgium and Australia also participated in the PISA 2015 financial literacy assessments. However, their data are excluded from this analysis because all students in the Flemish Community of Belgium attend public schools, and Australia’s data are not publicly available. [↑](#footnote-ref-28)