



Results from HKPISA 2012



HKPISA

Hong Kong Students On Line: Digital Technologies and Computer- based Assessment in PISA 2012

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COMPUTER-BASED ASSESSMENT IN PISA 2012

- ✘ In PISA 2012, 44 countries and economies participated in an optional computer-based assessment (CBA) of students' problem-solving competency
- ✘ Of these, 32 countries/economies also participated in the CBA of mathematics and reading
- ✘ ICT familiarity questionnaire was administered to students in 43 countries/economies

OVERVIEW

- ✘ Quality: Overall performance of Hong Kong students in computer-based assessment of problem solving, mathematics and reading
- ✘ Equality: Distribution of digital performance by gender, immigrant status and ESCS; Digital divide among schools
- ✘ ICT: ICT accessibility outside school and in school; Attitude toward ICT
- ✘ Effect of ICT factors on digital performance

DEFINITION OF CBA PROBLEM SOLVING

- ✘ PISA 2012: the first large-scale international study to assess performance in CBA problem solving.
- ✘ It represents a continuation of the data strategy of PISA 2003 adopted by OECD.
- ✘ The inclusion of interactive tasks represents the main innovation over the PISA 2003 assessment of paper-based problem solving, made possible by computer delivery.

Distribution of Problem Solving Items by Nature of Problem Situation

	Number of items	Percentage of items
Interactive	27	64.3%
Static	15	35.7%

- Interactive: Not all information is disclosed; some information has to be uncovered by exploring the problem situation
- Static: All relevant information for solving the problem is disclosed at the outset

DEFINITION OF CBA PROBLEM SOLVING (CONT.)

- ✘ ...an individual's capacity to engage in cognitive processing to understand and resolve problem situations where a method of solution is not immediately obvious. It includes the willingness to engage with such situations in order to achieve one's potential as a constructive and reflective citizen.
(OECD, 2013 : PISA 2012 conceptual framework)

DEFINITION OF CBA MATHEMATICS

- ✘ PISA 2012: the first large-scale international study to assess performance in CBA math.
- ✘ The definition of mathematical literacy explicitly includes the use of mathematical tools. CBA will provide the opportunity to include a wider range of mathematics tools – such as statistical software, geometric construction and visualization utilities, and virtual measuring instruments – into the assessment items.
- ✘ This will reflect the medium that increasingly more individuals use for interfacing with their world and for solving problems.
- ✘ It also will provide the opportunity to assess some aspects of mathematical literacy that are not easily accessed via traditional paper-based tests.

(PISA 2012 conceptual framework)

DEFINITION OF DIGITAL READING

- ✘ PISA 2009 was the first large-scale international study to assess performance in digital reading. PISA 2012 is the second time for the assessment
- ✘ Digital reading demands new emphases and strategies be added to readers' repertoire.
- ✘ Gathering information in the Internet requires skimming and scanning through large quantity of material and immediately evaluating its credibility.
- ✘ Critical thinking becomes more important in reading literacy.

(PISA 2009 conceptual framework)

TEST DESIGN

- ✘ As usual in PISA, items are arranged in units grouped around a common stimulus (e.g. text, table, chart, figures, etc.) followed by a number of related assessment tasks.
- ✘ In PISA 2012, the survey included 16 units, with a total of 42 items for CBA problem solving. As for CBA math and digital reading, the survey included 15 units and 6 units respectively.
- ✘ Sample items can be found in the HKPISA Centre's website: <http://www.fed.cuhk.edu.hk/~hkpisa/>

I. Digital performances

MAJOR FINDINGS

PISA 2012 TOP 10 COUNTRIES/ECONOMIES (COMPUTER-BASED ASSESSMENT, CBA)

CBA Problem Solving			CBA Mathematics			Digital Reading		
Countries/Economies	Mean	S.E.	Countries/Economies	Mean	S.E.	Countries/Economies	Mean	S.E.
Singapore	562	(1.2)	Singapore	566	(1.3)	Singapore	567	(1.2)
Korea	561	(4.3)	Shanghai-China	562	(3.4)	Korea	555	(3.6)
Japan	552	(3.1)	Korea	553	(4.5)	Hong Kong-China	550	(3.6)
Macao-China	540	(1.0)	Hong Kong-China	550	(3.4)	Japan	545	(3.3)
Hong Kong-China	540	(3.9)	Macao-China	543	(1.1)	Canada	532	(2.3)
Shanghai-China	536	(3.3)	Japan	539	(3.3)	Shanghai-China	531	(3.7)
Chinese Taipei	534	(2.9)	Chinese Taipei	537	(2.8)	Estonia	523	(2.8)
Canada	526	(2.4)	Canada	523	(2.2)	Australia	521	(1.7)
Australia	523	(1.9)	Estonia	516	(2.2)	Ireland	520	(3.0)
Finland	523	(2.3)	Belgium	512	(2.5)	Chinese Taipei	519	(3.0)

PERFORMANCE OF CBA PROBLEM SOLVING

- ✘ A mean score of 540
- ✘ Ranks 4th (4-7th) among the 44 participating countries/economies.
- ✘ Of the top 10 countries/ economies, Hong Kong students perform:
 1. Significantly worse than Singapore (562), Korea (561) and Japan (552)
 2. Not statistically different from Macao (540), Shanghai (536) and Chinese Taipei (534)
 3. Better than Canada (526), Australia (523) and Finland (523)

PERFORMANCE OF CBA MATHEMATICS

- ✘ A mean score of 550
- ✘ Ranks 4th (3-5th) among the 32 participating countries/economies.
- ✘ Of the top 10 countries/ economies, Hong Kong students perform:
 1. Significantly worse than Singapore (566) and Shanghai (562)
 2. Not statistically different from Korea (553) and Macao (543)
 3. Better than Japan (539) Chinese Taipei (537), Canada (523), Estonia (516) and Belgium (512)

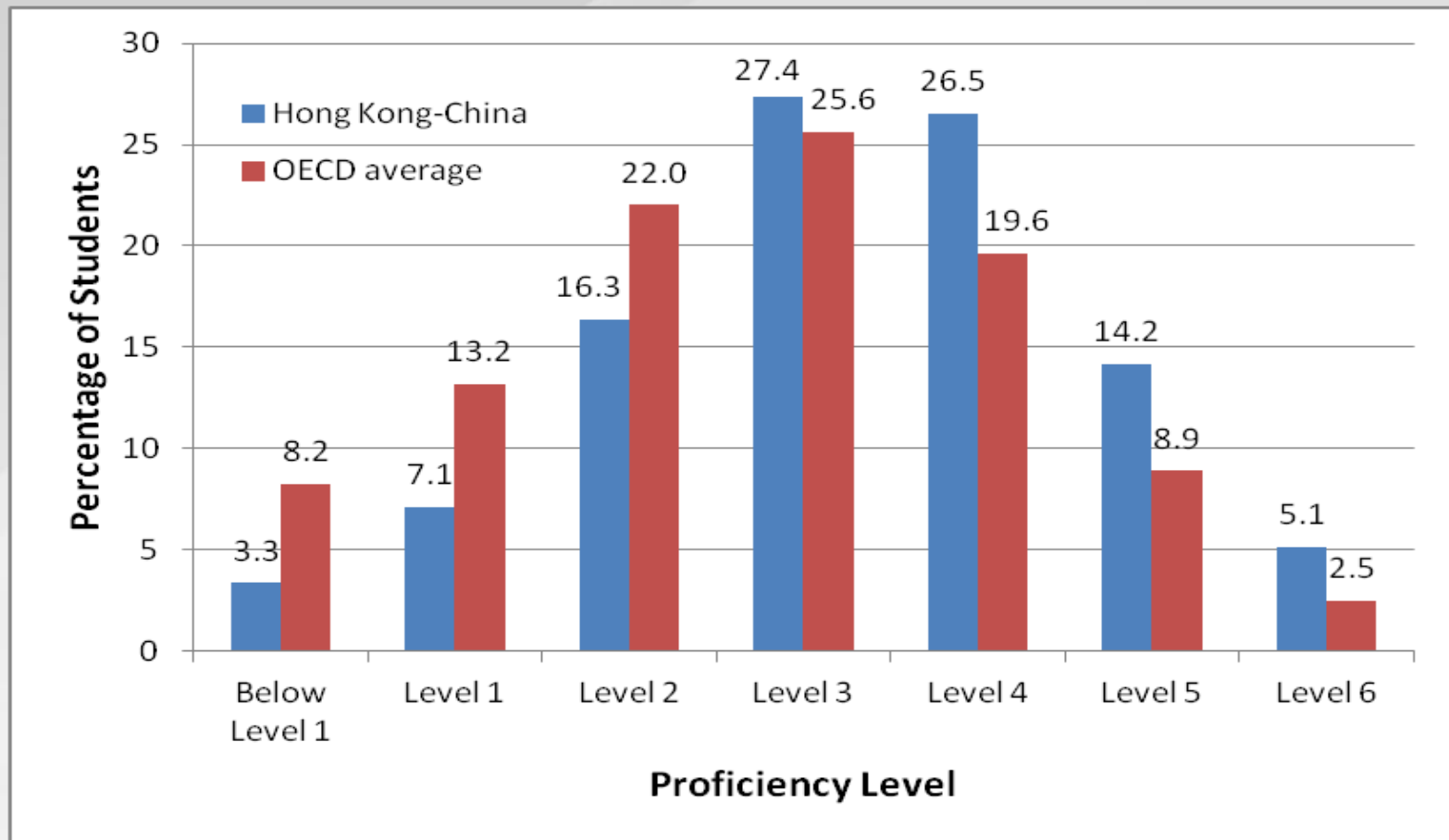
TOP 10 COUNTRIES/ECONOMIES IN PISA 2009 & 2012 (DIGITAL READING)

Digital Reading (2012)			Digital Reading (2009)		
Countries/Economies	Mean	S.E.	Countries/Economies	Mean	S.E.
Singapore	567	(1.2)	Korea	568	(3.0)
Korea	555	(3.6)	New Zealand	537	(2.3)
Hong Kong-China	550	(3.6)	Australia	537	(2.8)
Japan	545	(3.3)	Japan	519	(2.4)
Canada	532	(2.3)	Hong Kong-China	515	(2.6)
Shanghai-China	531	(3.7)	Iceland	512	(1.4)
Estonia	523	(2.8)	Sweden	510	(3.3)
Australia	521	(1.7)	Ireland	509	(2.8)
Ireland	520	(3.0)	Belgium	507	(2.1)
Chinese Taipei	519	(3.0)	Norway	500	(2.8)

PERFORMANCE OF DIGITAL READING IN PISA 2009-2012

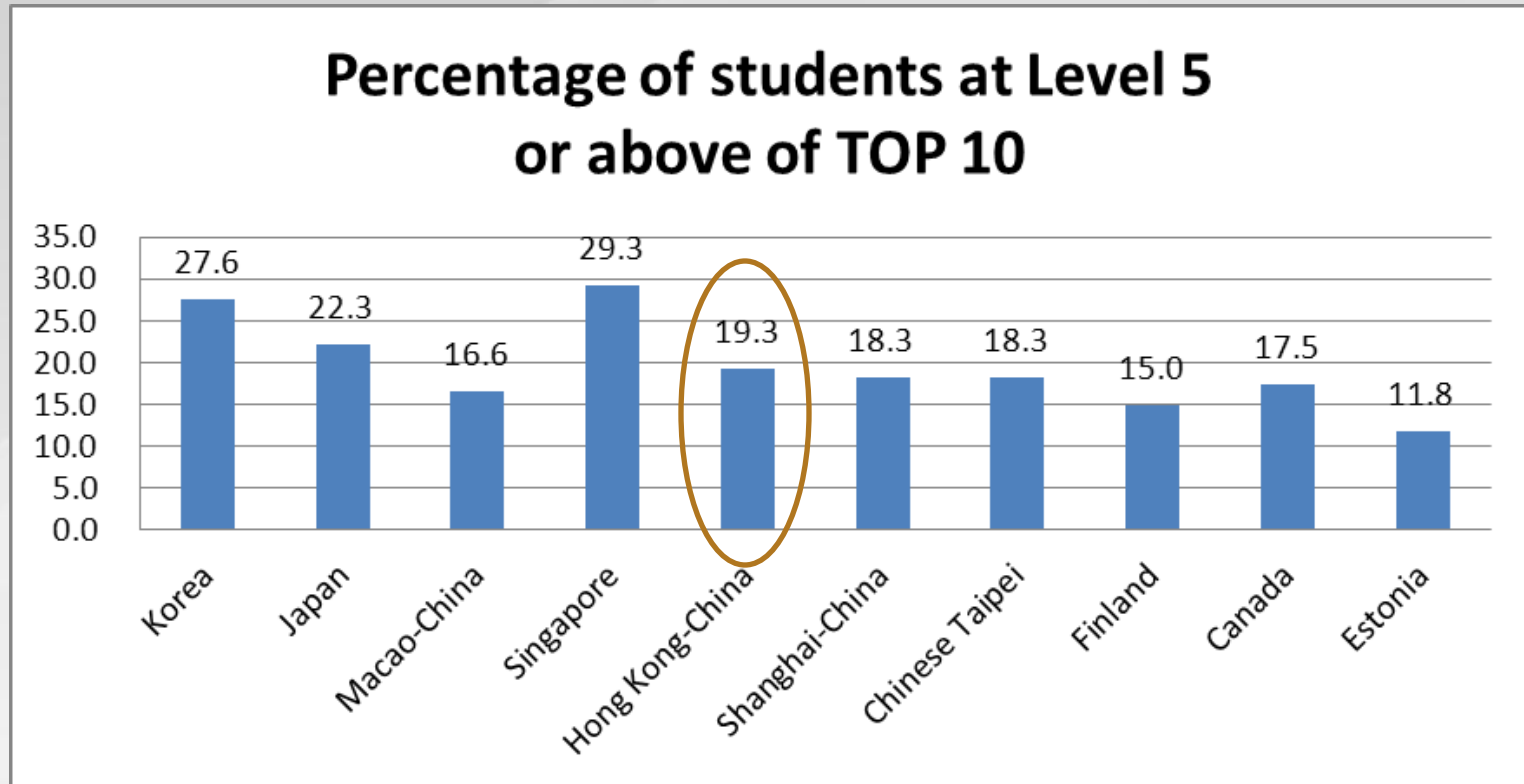
- ✘ A mean score of **515** in 2009 and **550** in 2012
- ✘ Ranks **5th** (4-7th) among the 19 participating countries/economies in 2009.
- ✘ Ranks **3rd** (2-4th) among the 32 participating countries/economies in 2012
- ✘ In 2009, far below Korea's (568), New Zealand's (537), and Australia's (537).
- ✘ In 2012, only below Singapore's (567) & Korea's (555)

CBA PROBLEM SOLVING: DISTRIBUTION OF PROFICIENCY LEVELS BETWEEN HONG KONG AND OECD AVERAGE (PISA 2012)



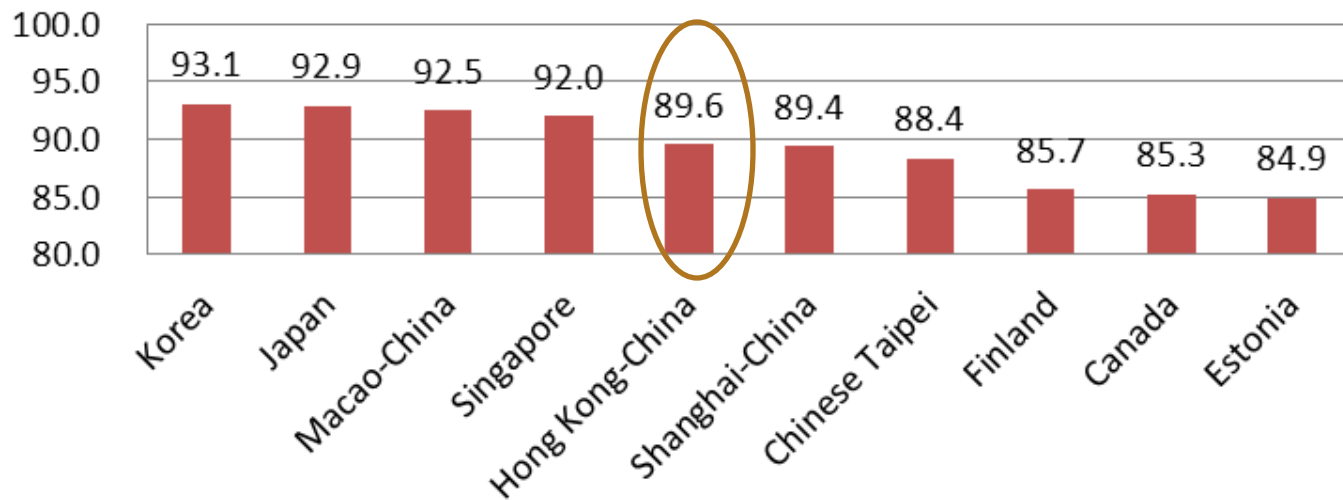
Level 2 (baseline level), Level 5 or above (top levels)

TOP 10 COUNTRIES/ECONOMIES: PROFICIENCY LEVELS AT LEVEL 5 OR ABOVE (CBA PROBLEM SOLVING)

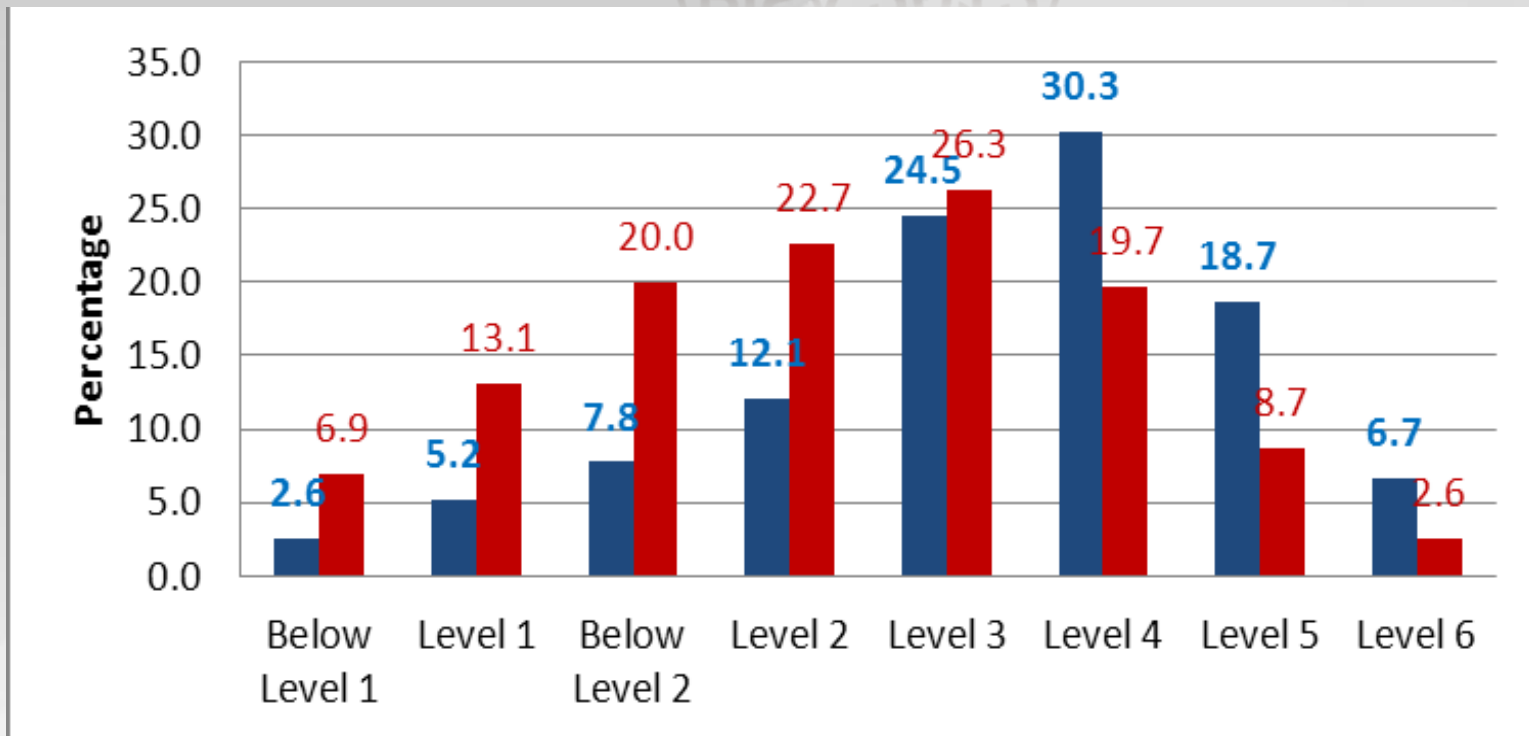


TOP 10 COUNTRIES/ECONOMIES: PROFICIENCY LEVELS AT LEVEL 2 OR ABOVE (CBA PROBLEM SOLVING)

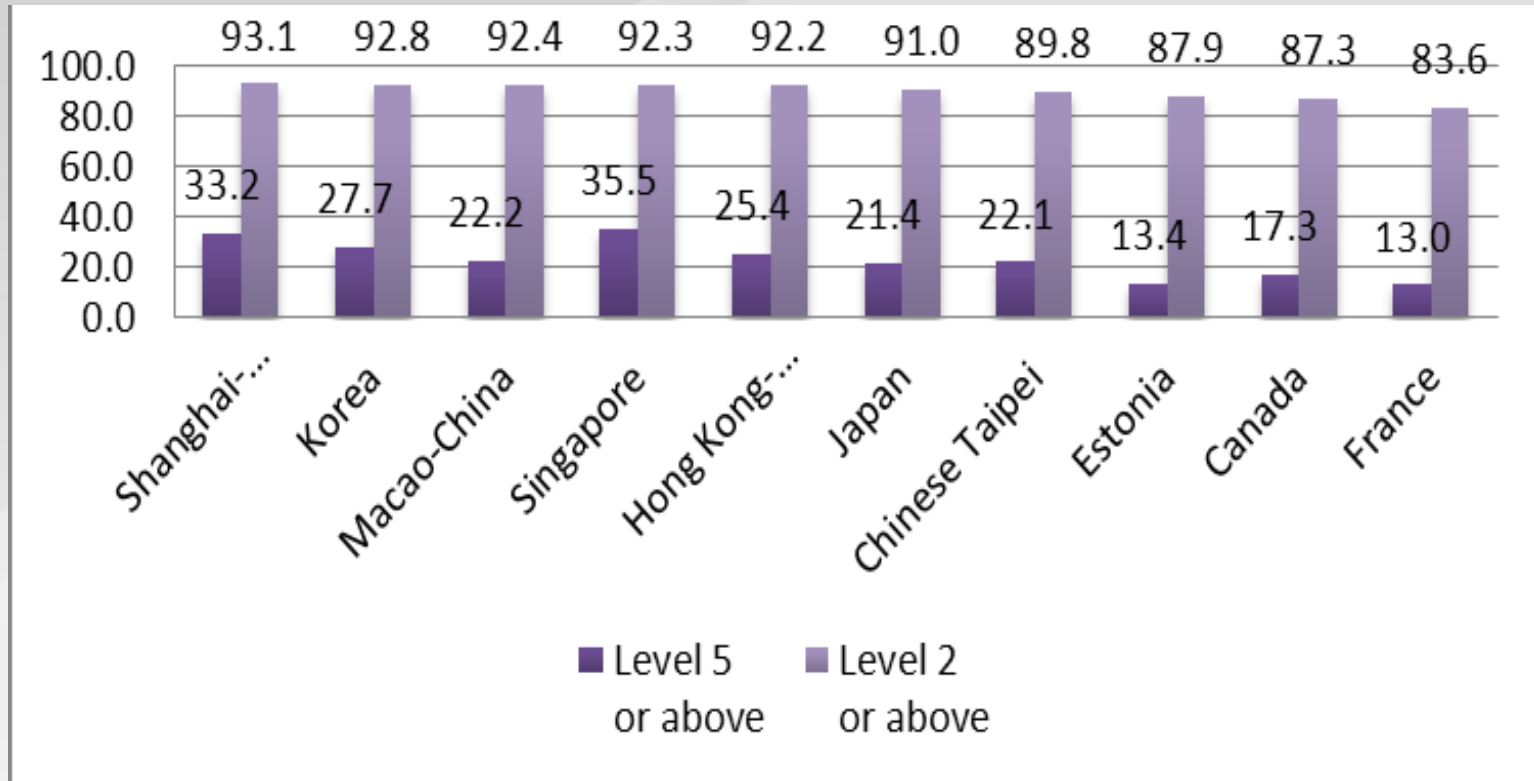
**Percentage of students at Level 2
or above of Top 10
countries/economies**



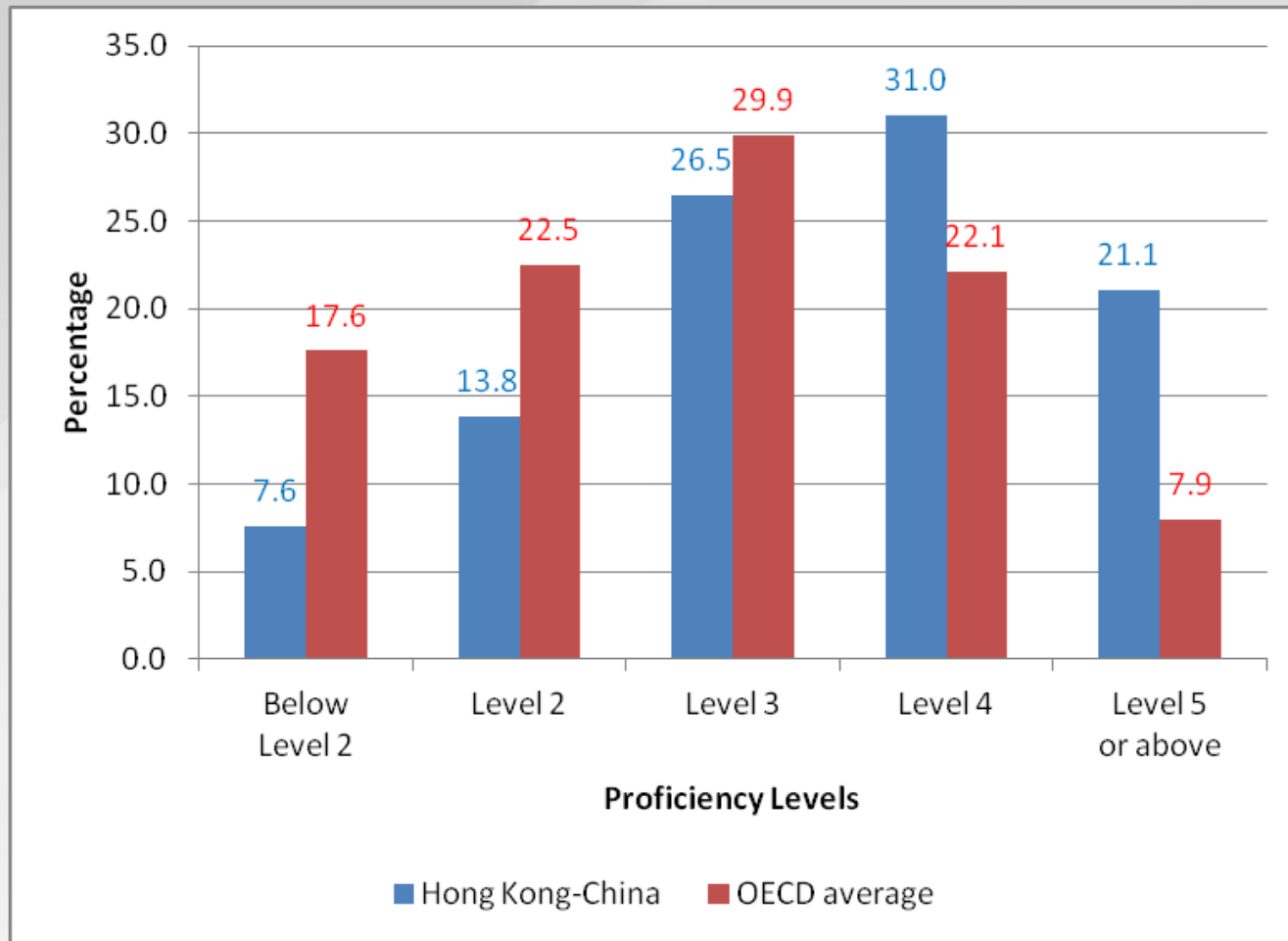
CBA MATHEMATICS: DISTRIBUTION OF PROFICIENCY LEVELS BETWEEN HONG KONG AND OECD AVERAGE (PISA 2012)



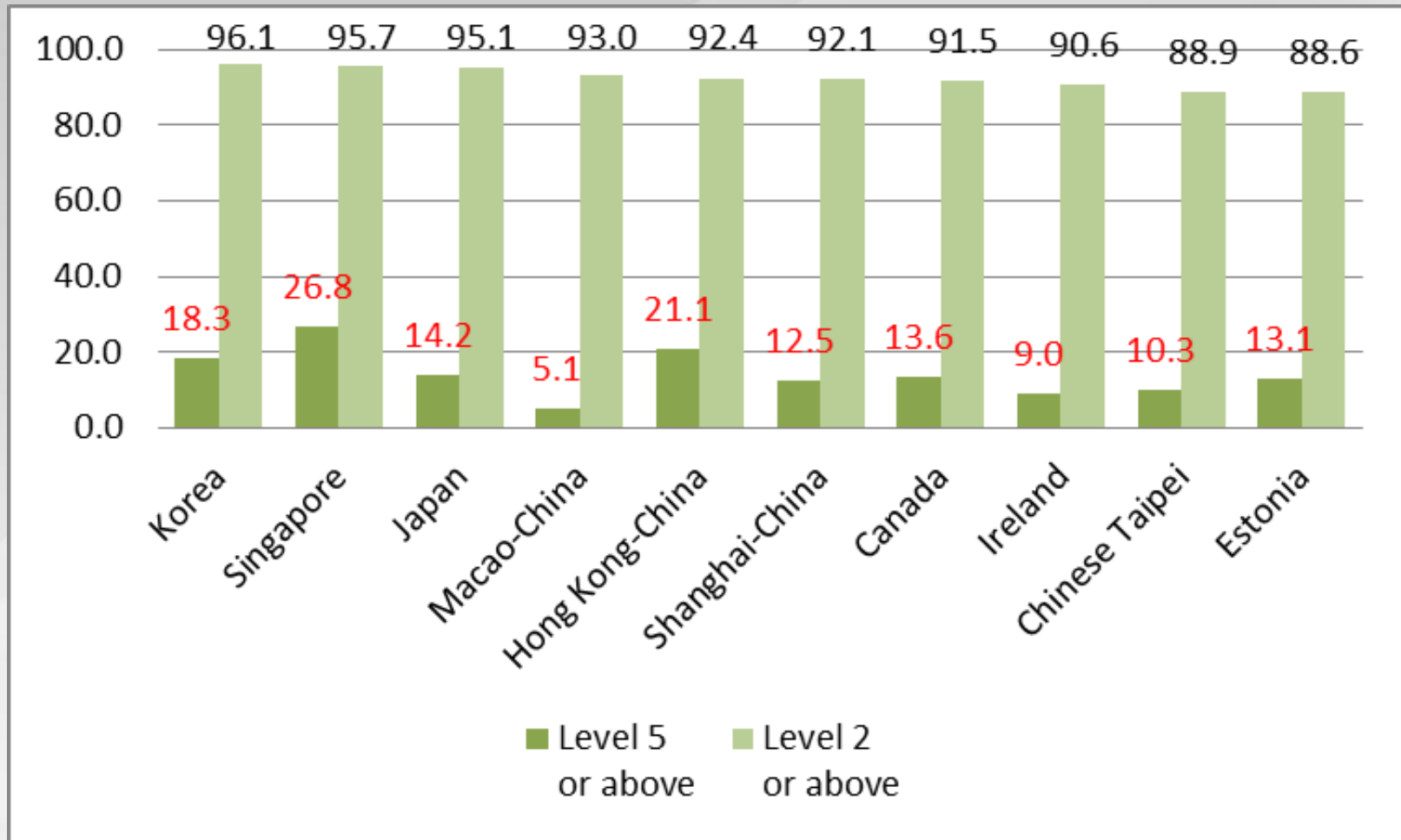
PERCENTAGE OF TOP ACHIEVERS AND BASIC ACHIEVERS OF TOP 10 COUNTRIES IN CBA MATHEMATICS (PISA 2012)



DIGITAL READING: DISTRIBUTION OF PROFICIENCY LEVELS BETWEEN HONG KONG AND OECD AVERAGE (PISA 2012)



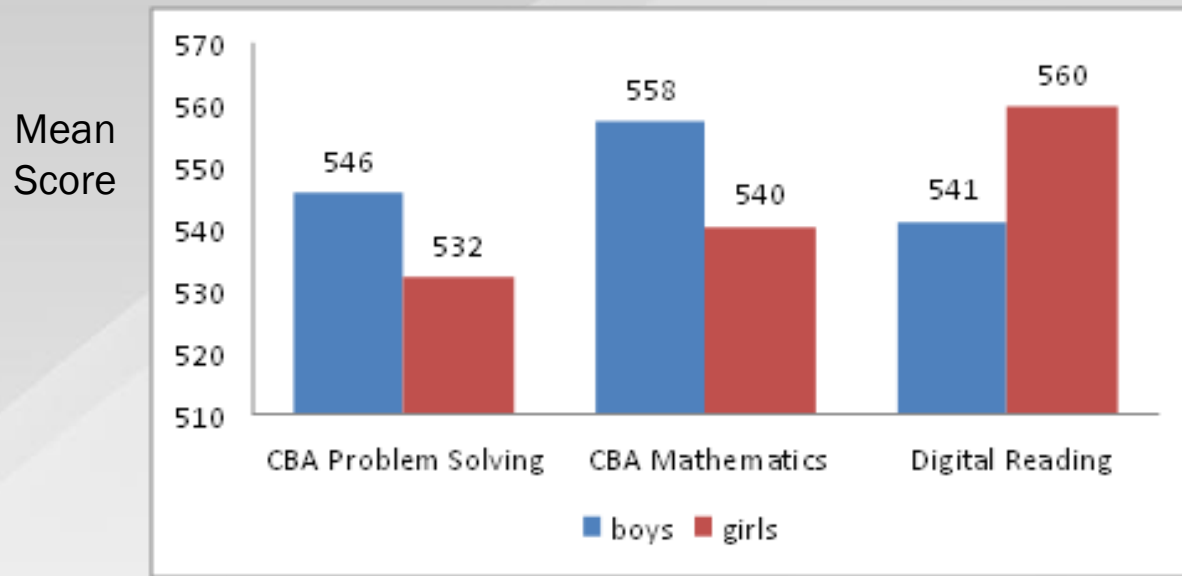
PERCENTAGE OF TOP ACHIEVERS AND BASIC ACHIEVERS OF TOP 10 COUNTRIES/ECONOMIES IN DIGITAL READING (PISA 2012)



II. Student Characteristics and Family Factors related to Digital Performances

MAJOR FINDINGS

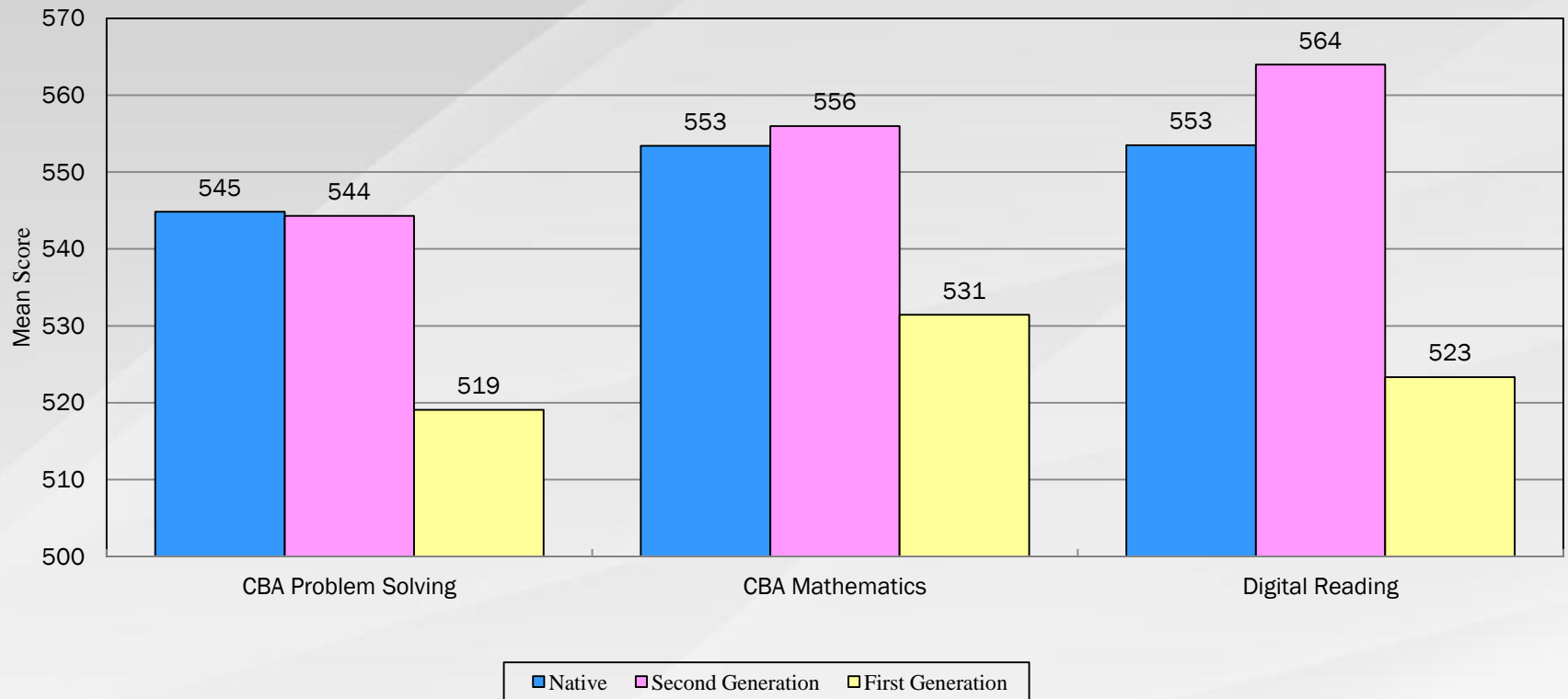
1. GENDER DIFFERENCES IN CBA PROBLEM SOLVING, CBA MATHEMATICS AND DIGITAL READING IN HONG KONG



- Boys outperform girls in CBA problem solving by 13# points. Similarly to the paper-based assessment (PBA), boys outperform girls in CBA mathematics but girls outperform boys in digital reading.
 - The gender gap in mathematics in CBA (17# points) is slightly larger than in PBA (15 points) . Girls' advantage in reading in PBA (25 points) is larger than in CBA (19 points).
- #The minor discrepancy in the difference from the graph is due to rounding off numbers

2. DIGITAL PERFORMANCE BY IMMIGRANT STATUS

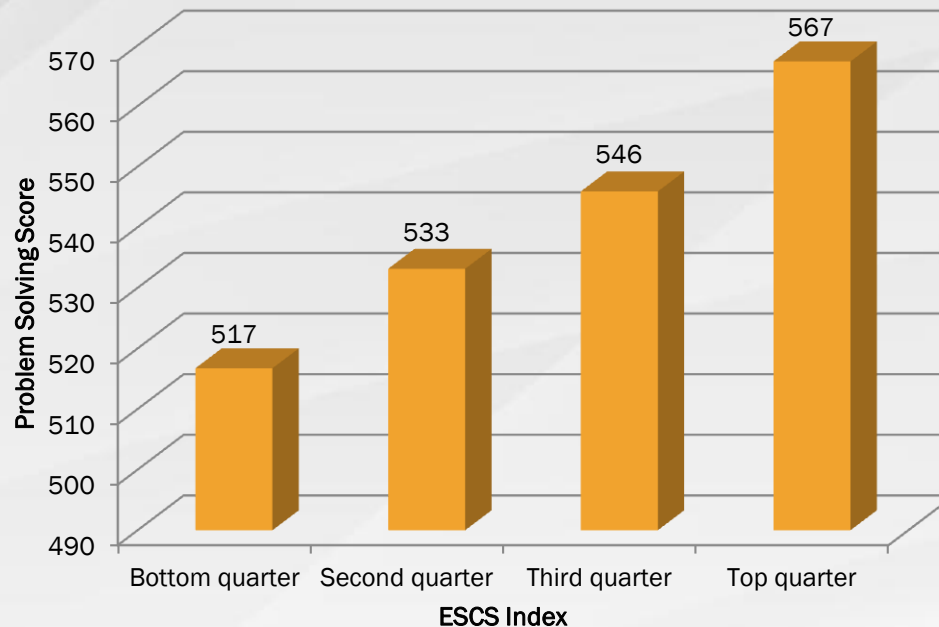
Similarly to PBA, the disadvantages of the first-generation students are again of statistical significance.



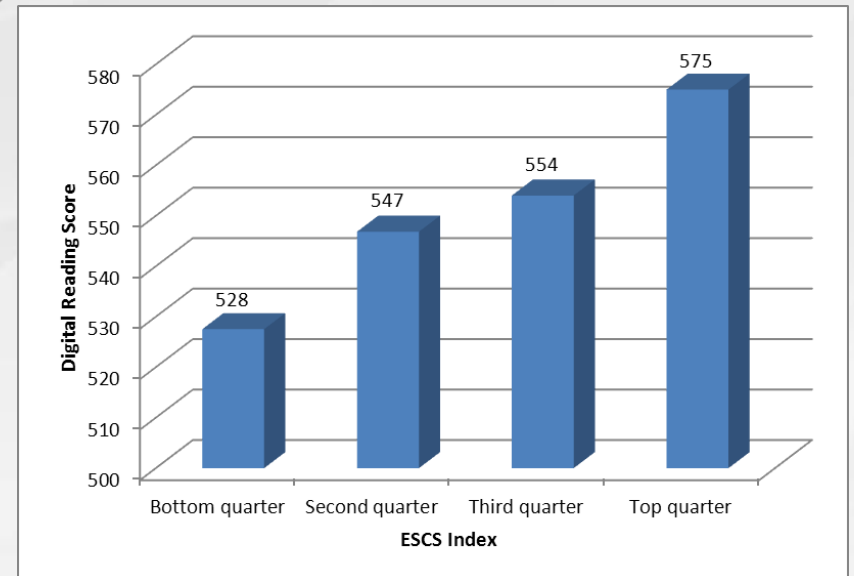
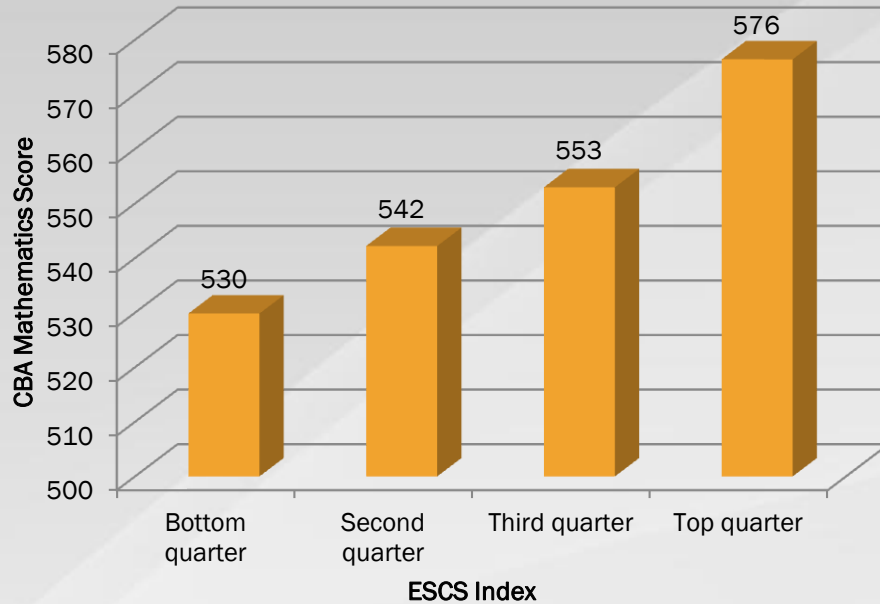
In PISA 2012, the percentages of second-generation students and first-generation students are 20.5% and 14.2% respectively (a total of 34.7% immigrant students), which are slightly lower than those of 2009 (23.8+15.7=39.5%)

3. CBA PROBLEM SOLVING PERFORMANCE BY ECONOMIC, SOCIAL AND CULTURAL STATUS (ESCS)

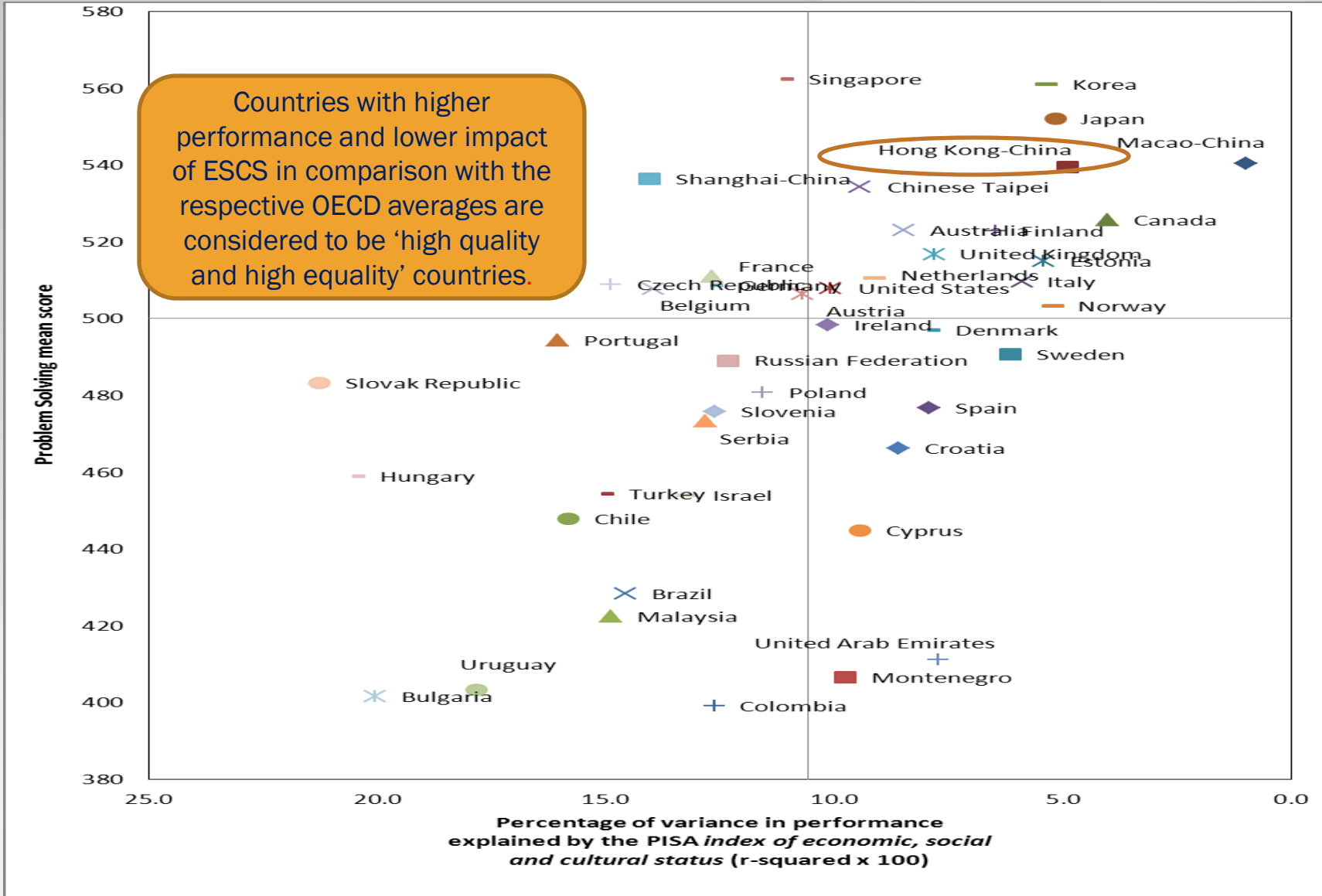
- ✘ Average score of Hong Kong students increases moderately with students' ESCS, that is, students from more advantaged families tend to achieve higher scores.



4. CBA MATHEMATICS & DIGITAL READING SCORES BY ESCS



5. QUALITY & EQUALITY OF CBA PROBLEM SOLVING PERFORMANCE



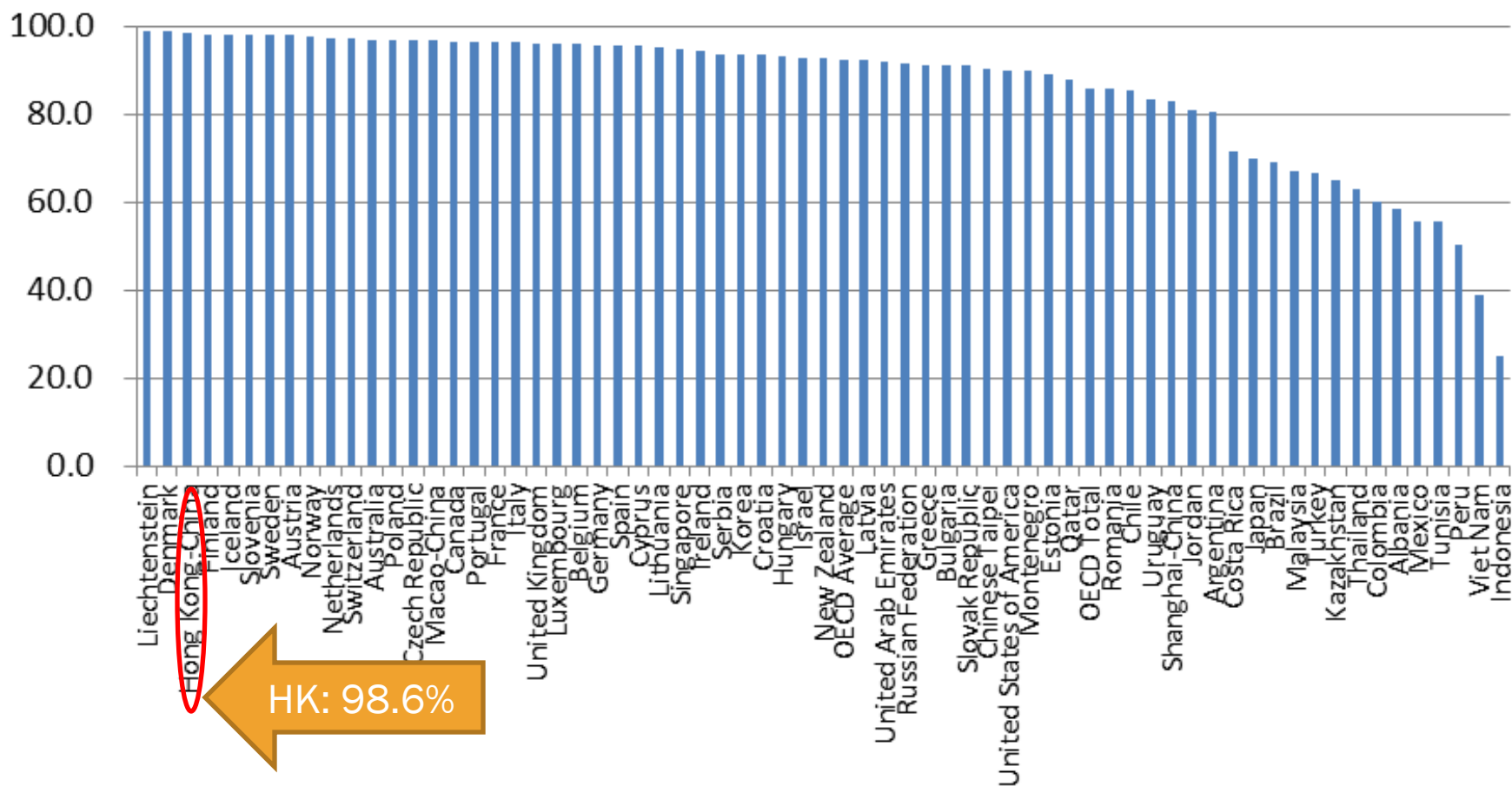
Among the participating countries/economies, many East Asian countries/economies such as Chinese Taipei, Korea, Japan, Macao, Hong Kong, and some other countries including Canada, Australia, Finland, UK, Estonia and Italy constitute the group of high performance/low socio-economic impact countries.

III. ICT and Digital Performances

MAJOR FINDINGS

1. ICT ACCESSIBILITY OUTSIDE SCHOOL (PISA 2012)

Percentage of Students Who Reported to Have a Computer at Home in 2012

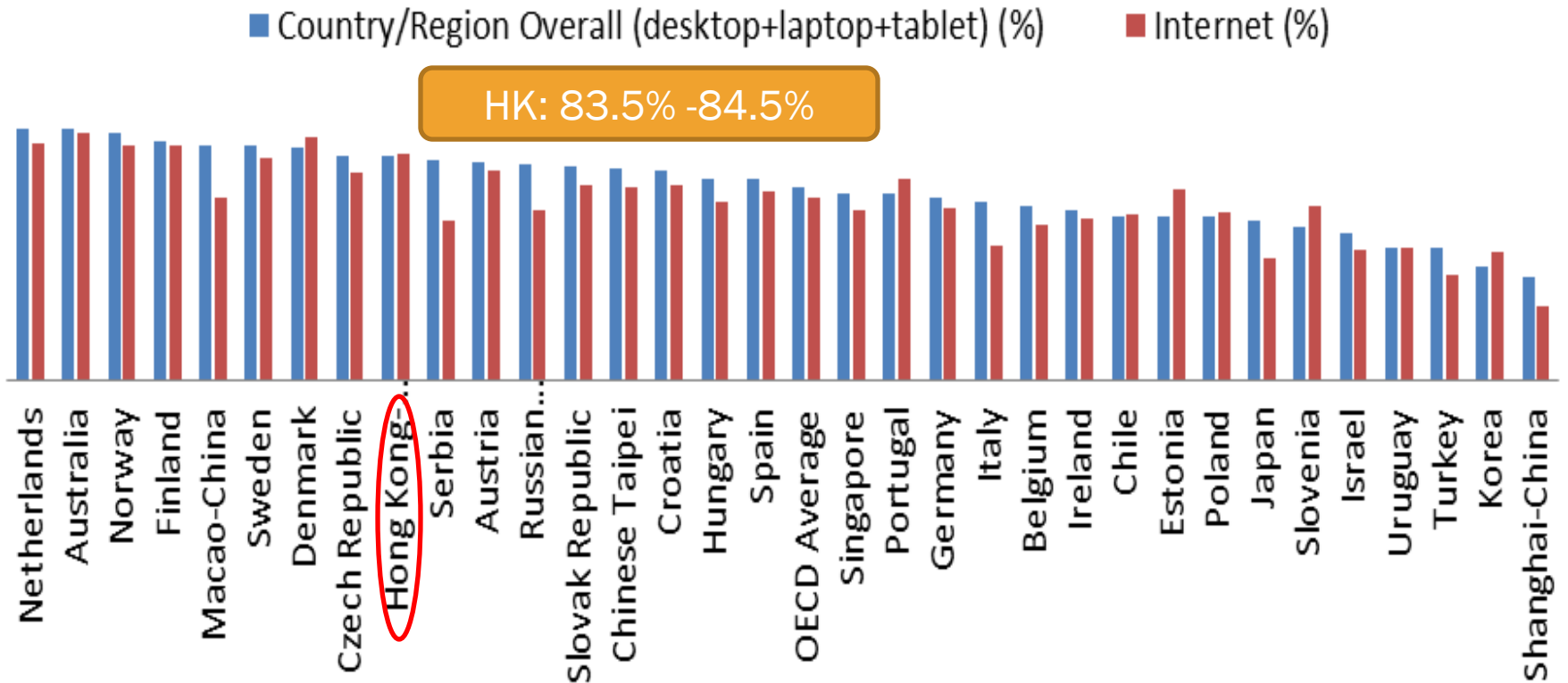


2. ICT ACCESSIBILITY OUTSIDE SCHOOL (PISA 2012)

- ✘ Almost all 15-year-old HK students have access to computers and the Internet outside school since 2000.
- ✘ From 2000 to 2012, figures improved
 - + from 94.5% (2000), 92.6%(2003), 99.0% (2009) to **98.6% (2012) for computer access**
 - + from 84.8% (2000), 88.3% (2003), 98.0% (2009) to **99.1% (2012) for Internet access**

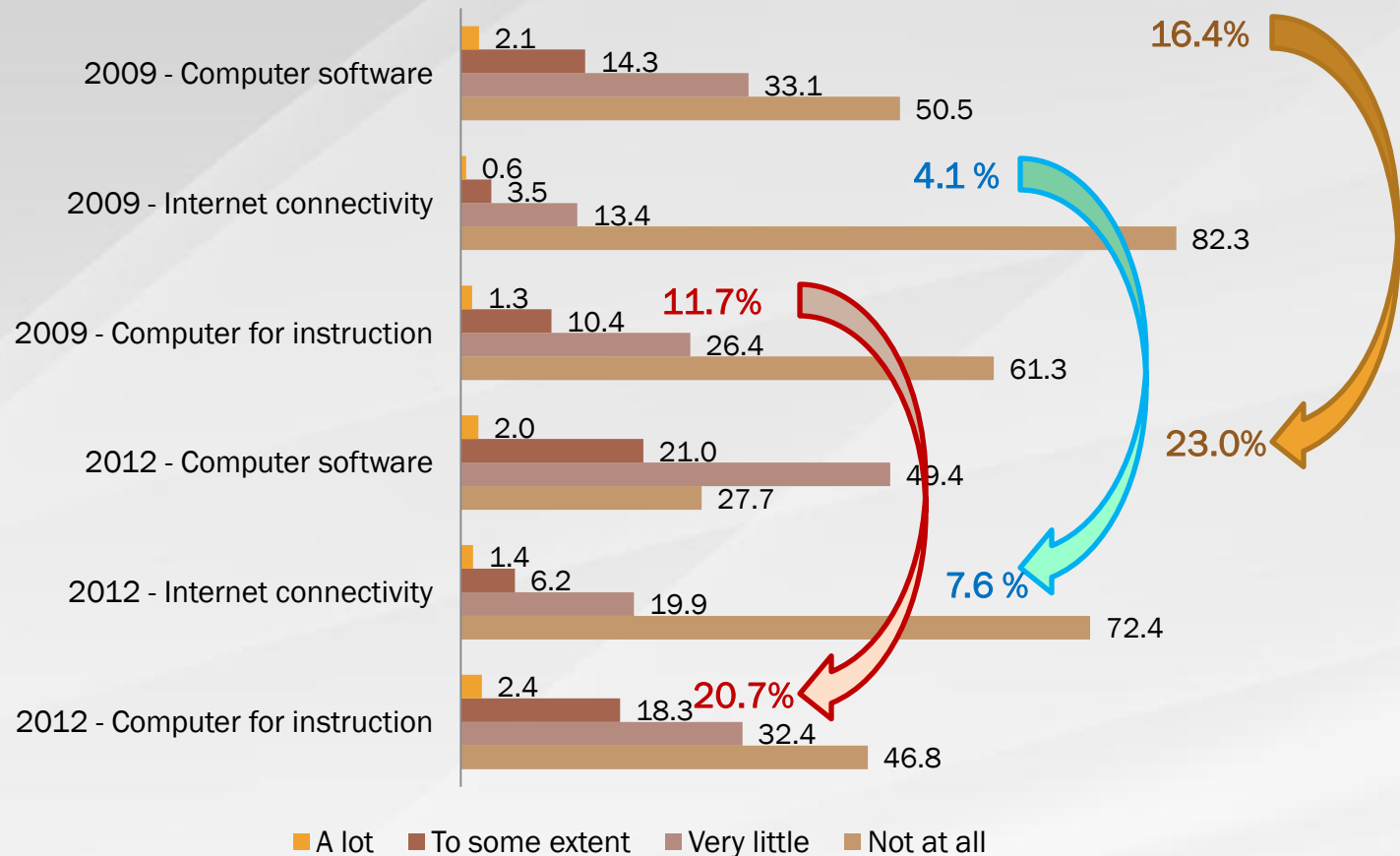
3. ICT ACCESSIBILITY IN SCHOOL (PISA 2012)

Percentage of Students with Access to Computers and Access to Internet at School



4. PERCENTAGE OF SCHOOLS REPORTING SHORTAGE OF ICT FACILITIES

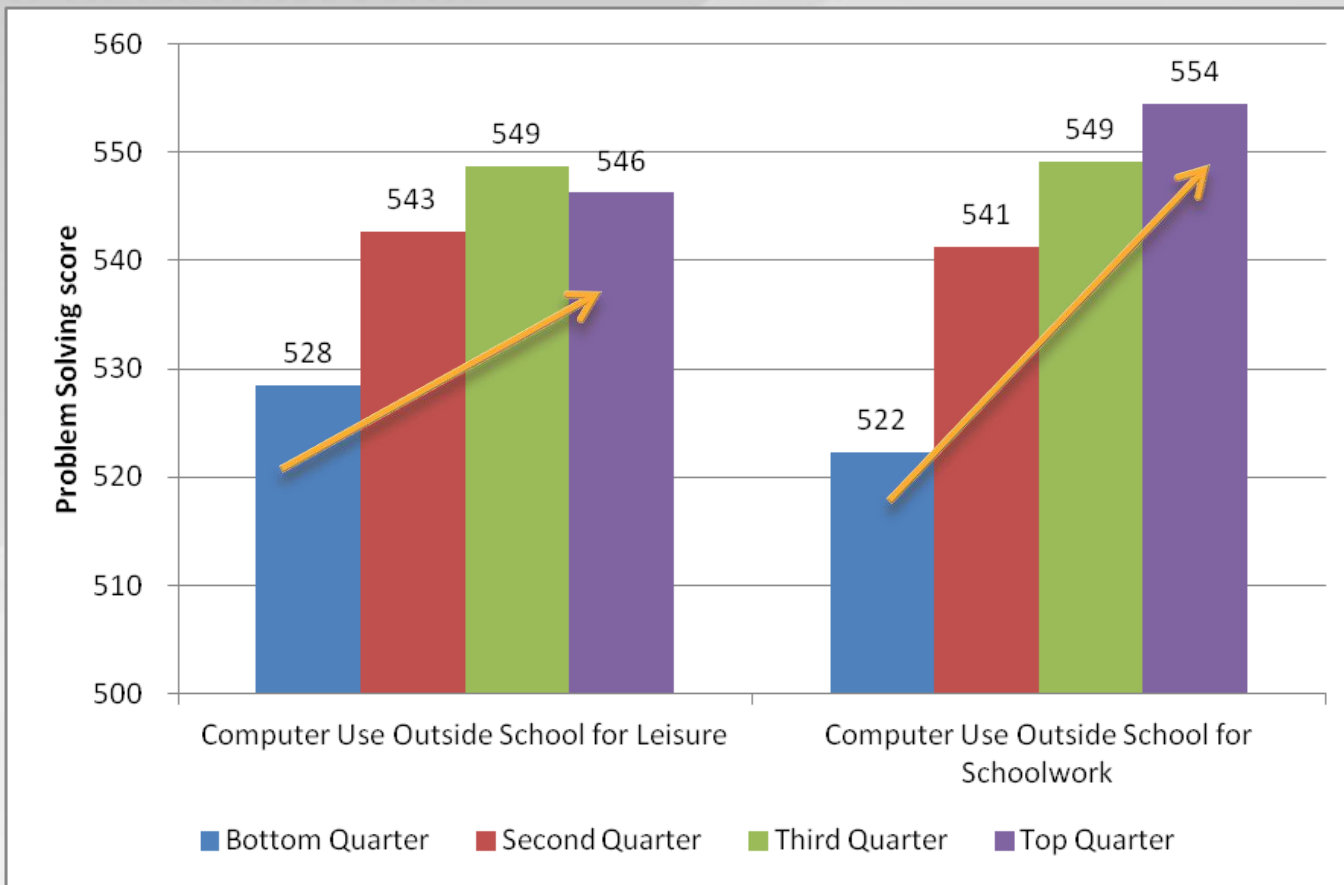
Percentage of schools reporting **shortage** of ICT facilities



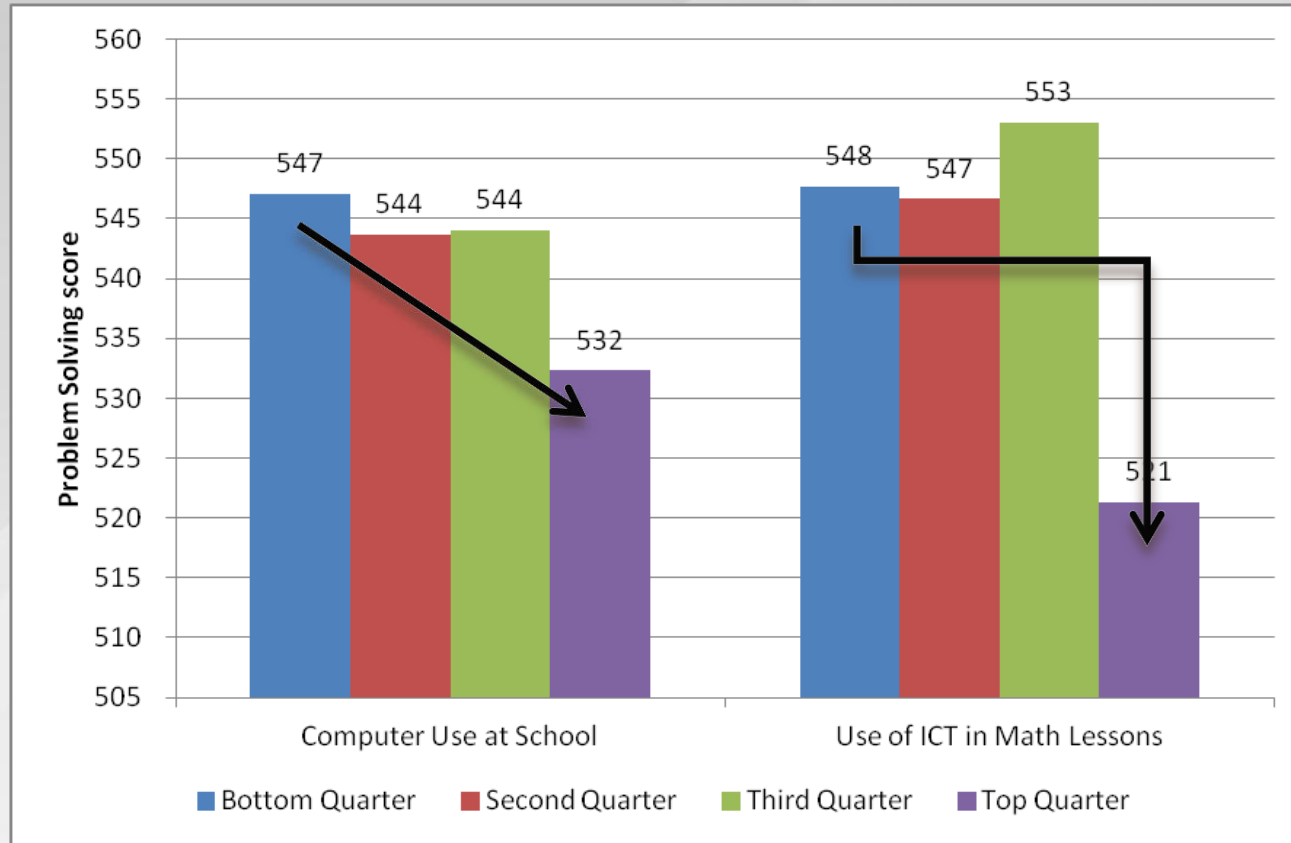
5. EFFECTIVE WAYS OF USING ICT OUTSIDE SCHOOL

- ✘ Computer use outside school has strongly positive relationship with digital performance
 - ✘ But not all activities contribute equally to student learning
 - ✘ Activities that contribute to better performance in CBA problem solving (PISA 2012) of HK students who do these activities everyday/almost everyday:
 - + Browsing the Internet for schoolwork
 - + Downloading, uploading or browsing materials from school's website
 - + Using email for communication with other students about school work
 - + Sharing school related materials with other students
 - + Reading news on the internet
 - + Using email
 - + Obtaining practical information form the internet
- For school work
- For leisure

6. RELATIONSHIP BETWEEN USE OF COMPUTER OUTSIDE SCHOOL FOR LEISURE AND SCHOOLWORK AND CBA PROBLEM SOLVING PERFORMANCE



7. RELATIONSHIP BETWEEN USE OF COMPUTER AT SCHOOL AND ICT IN MATHEMATICS CLASSROOM AND CBA PROBLEM SOLVING PERFORMANCE



No significant advantage of using computers at school on CBA problem solving performance

8. ATTITUDE TOWARDS PROBLEM SOLVING

(1) “Perseverance” index (堅持不懈)

Students were asked to report how well each of the following five statements describes them:

- ✘ 1. When confronted with a problem, I give up easily;
- ✘ 2. I put off difficult problems;
- ✘ 3. I remain interested in the tasks that I start;
- ✘ 4. I continue working on tasks until everything is perfect; and
- ✘ 5. When confronted with a problem, I do more than what is expected of me.

*Coded as: 1 for “very much like me”; 2 for “mostly like me”; 3 for “somewhat like me”; 4 for “not much like me” and 5 for “not at all like me”

*Items are coded and scaled such that higher scores on this index mean a higher level of perseverance.

9. ATTITUDE TOWARDS PROBLEM SOLVING (CONT.)

(2)“Openness” index (開放態度)

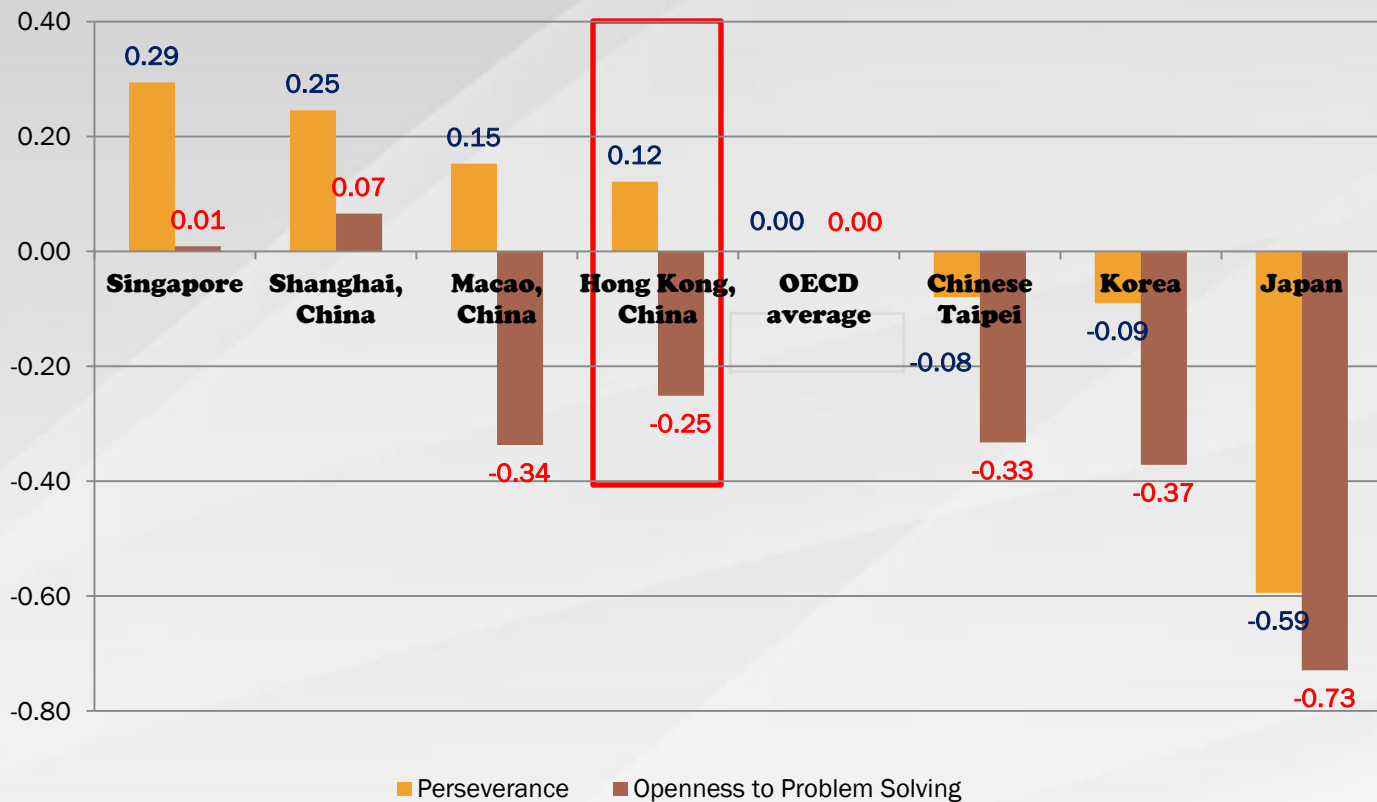
Students were asked to report how well each of the following five statements describes them:

- ✘ 1. I can handle a lot of information;
- ✘ 2. I am quick to understand things;
- ✘ 3. I seek explanations of things;
- ✘ 4. I can easily link facts together; and
- ✘ 5. I like to solve complex problems.”

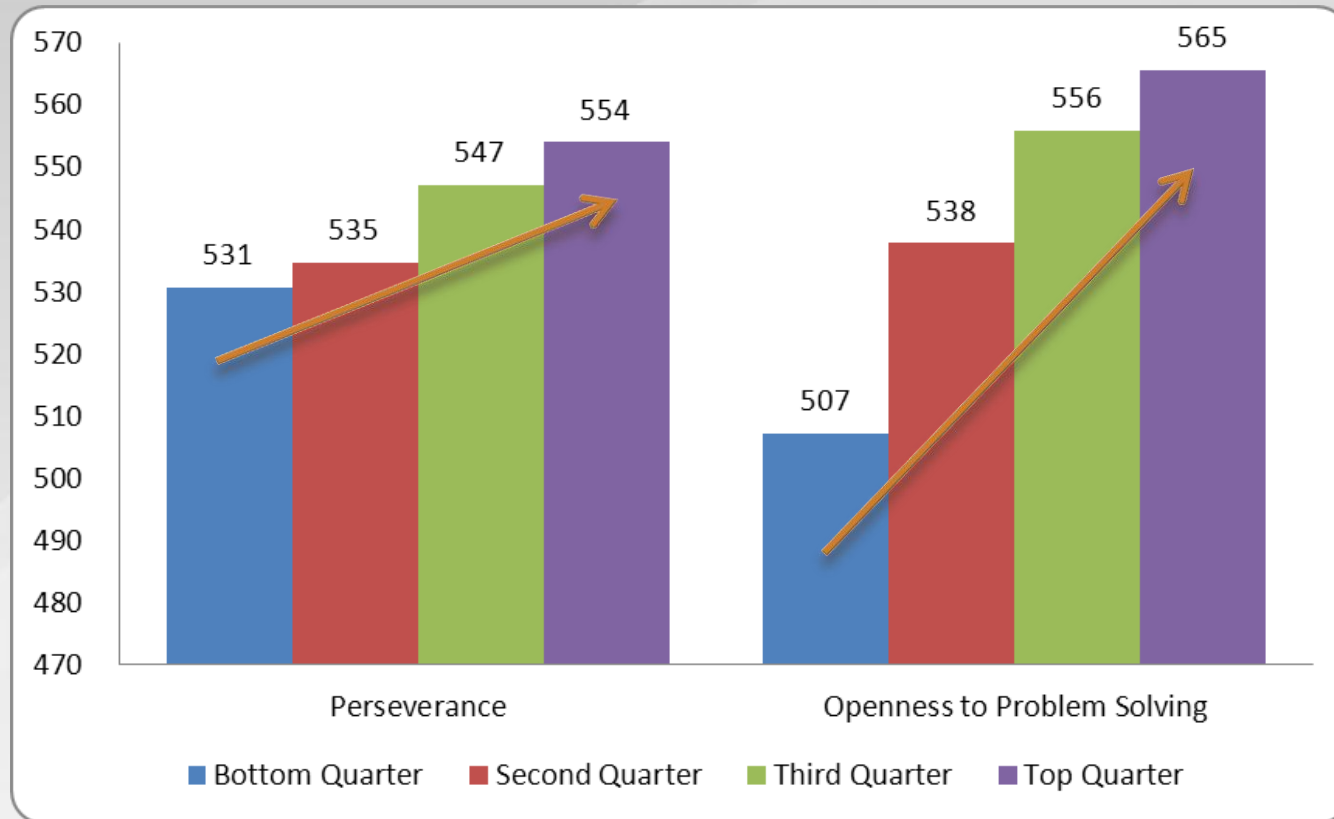
*Coded as: 1 for “very much like me”; 2 for “mostly like me”; 3 for “somewhat like me”; 4 for “not much like me” and 5 for “not at all like me”.

*Items are coded and scaled such that higher scores on this index mean a higher level of openness to problem solving.

10. PERSEVERANCE AND OPENNESS TO PROBLEM SOLVING ACROSS EAST ASIAN SOCIETIES IN PISA 2012



11. CBA PROBLEM SOLVING PERFORMANCE BY PERSEVERANCE AND OPENNESS

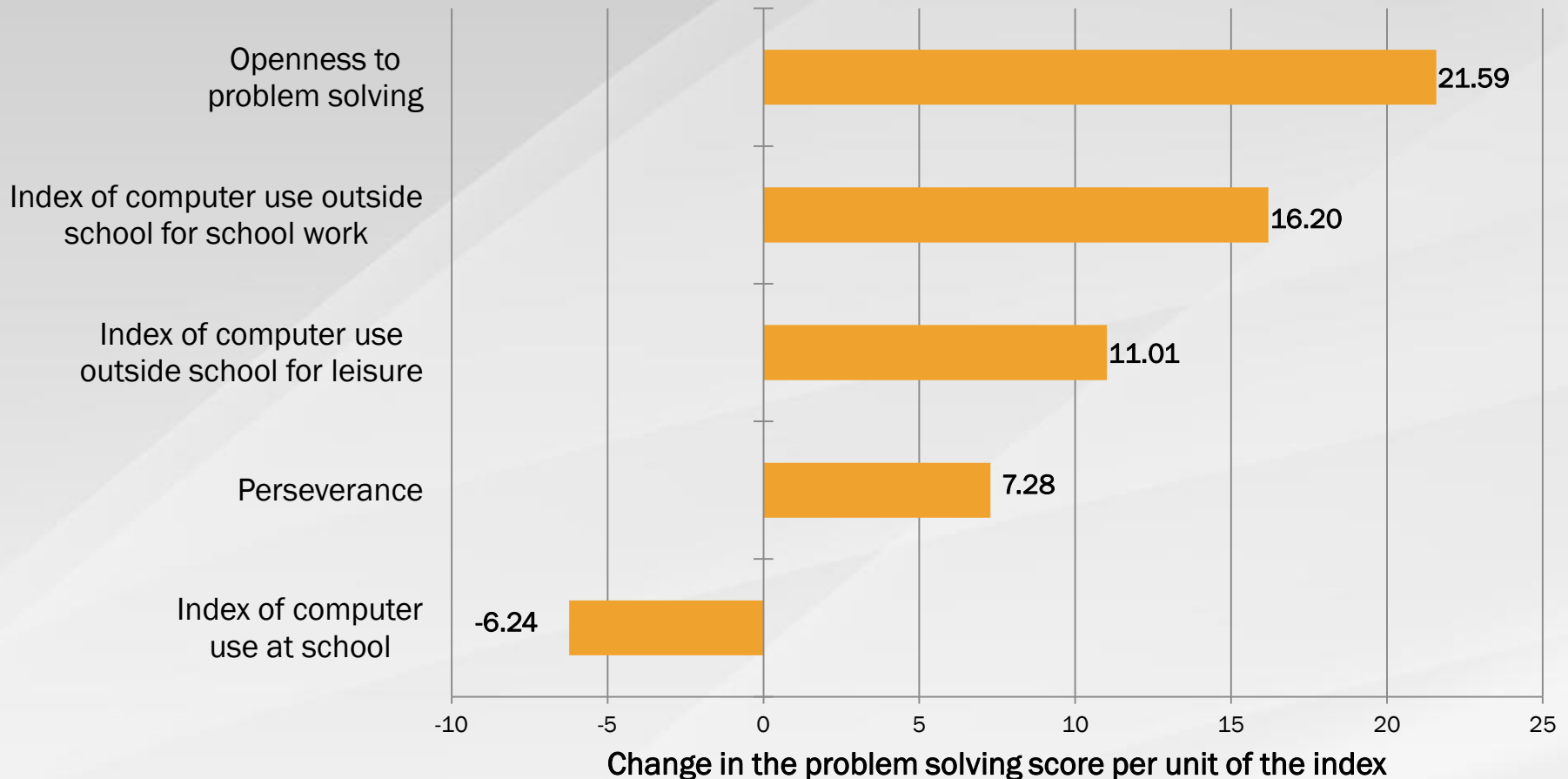


The performance difference between the bottom quarter and the top quarter of perseverance is 23 points (554-531), whereas for openness to problem solving the difference is 58 points (565-507).

IV. Factors related to Digital Performances

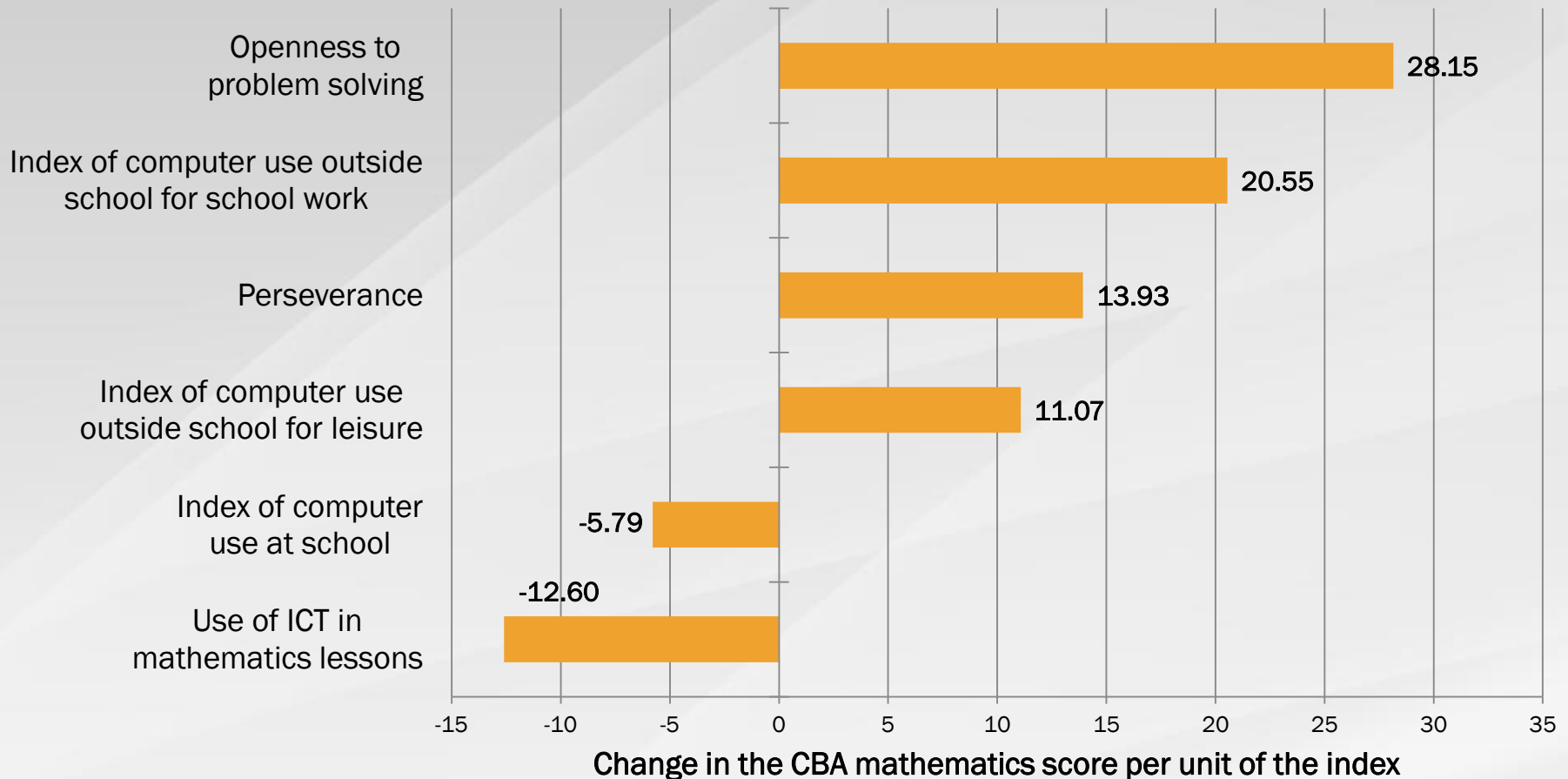
MAJOR FINDINGS

1. EFFECT OF ICT FACTORS ON CBA PROBLEM SOLVING FOR HONG KONG



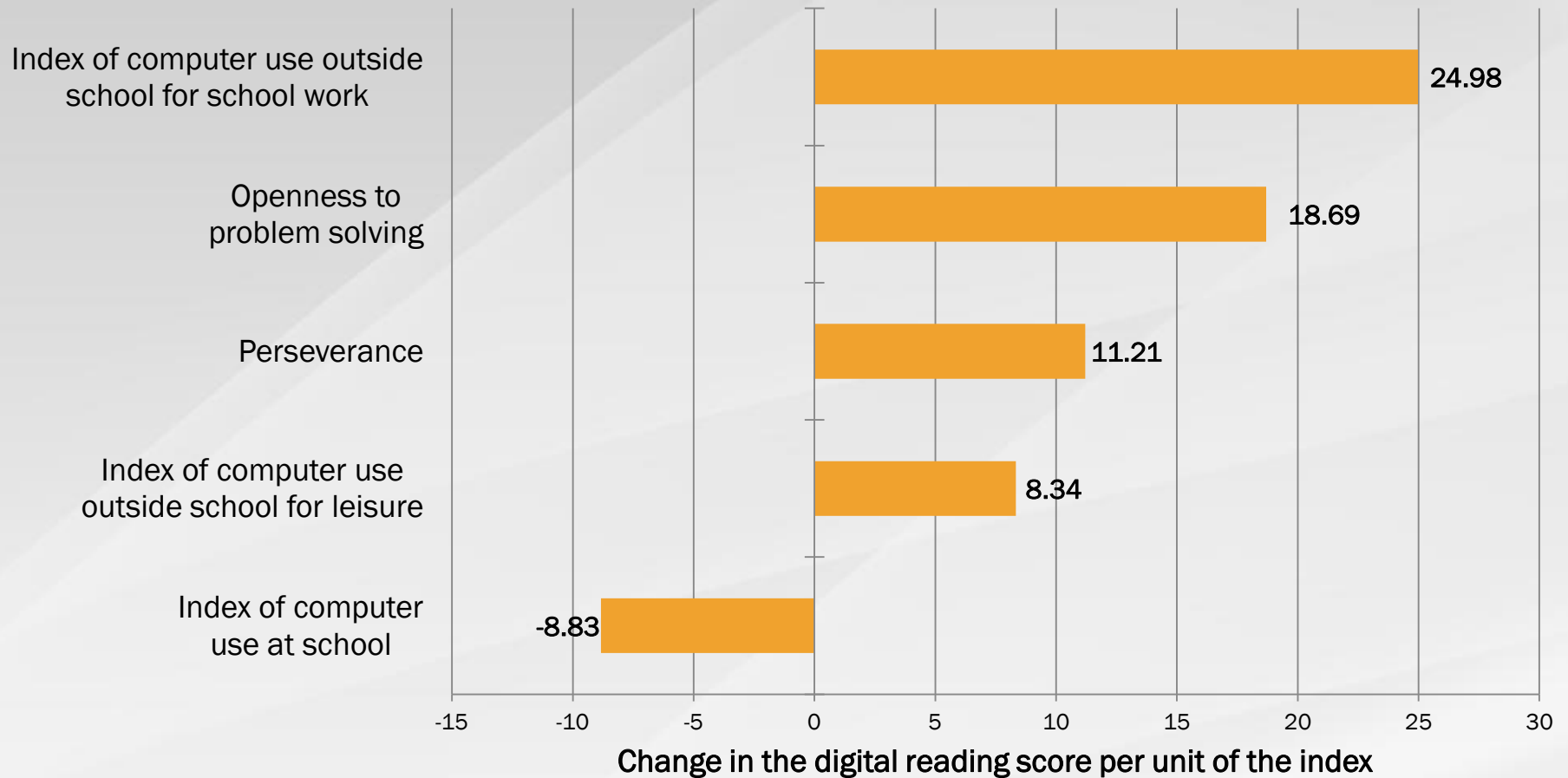
By simple regression on each of the ICT factors

2. EFFECT OF ICT FACTORS ON CBA MATHEMATICS FOR HONG KONG



By simple regression on each of the ICT factors

3. EFFECT OF ICT FACTORS ON DIGITAL READING FOR HONG KONG



By simple regression on each of the ICT factors

CONCLUSION (1)

(1) Results of computer-based assessment of Hong Kong

- ✘ Hong Kong students are exceptional performers in CBA problem solving, CBA mathematics and digital reading.
- ✘ Ranks the fourth (540) in CBA problem solving, the fourth (550) in CBA mathematics, and the third (550) in digital reading among all the participating countries or economies.

(2) Gender gap in digital world

- ✘ Boys outperform girls in CBA problem solving by 13 points and CBA mathematics by 17 points, and girls outperform boys in digital reading by 19 points.

CONCLUSION (2)

(3) First-generation students' disadvantage persists in digital world

- ✘ Similarly to the PBA of PISA 2012, first-generation students are at significant disadvantage in all three domains of CBA.

(4) Consistently low impact of ESCS in computer-based assessment

- ✘ The average socio-economic gradient of Hong Kong is 21 for CBA problem solving and 19 for CBA mathematics and digital reading, which are statistically significant but lower than the OECD average gradient.
- ✘ Among the participating countries/economies, Hong Kong belongs to the group of high performance/low socio-economic impact countries/economies.

CONCLUSION (3)

(5) Access to computer and Internet at home and in school

- ✘ Home access to computer and internet at home have risen in almost every country between 2003 and 2012.
- ✘ As for Hong Kong, the percentage of students reporting to have a computer at home increased from 93% in 2003 to 99% in 2012.
- ✘ As for Hong Kong the percentage of students reporting to have access to internet at home increased from 88% in 2003 to 99% in 2012.
- ✘ As for Hong Kong, about 84% of students reported that they had access to computers and about 85% to internet at school in 2012, which were higher than the respective OECD averages.

(6) Perseverance and Openness to problem solving

- ✘ Hong Kong students' perseverance to problem solving (0.12) is above OECD average
- ✘ but their openness to problem solving (-0.25) is far below OECD average

CONCLUSION (4)

(7) *Factors related to digital performance*

- ✘ Results from simple regression indicated that, of the indices of the ICT factors covered by PISA, openness to problem solving has the strongest association with students' CBA problem solving performance, which is about three times stronger than perseverance.
- ✘ Students' using computer outside school for leisure and for schoolwork also have moderately strong associations with students' CBA problem solving performance.



THANK YOU !



HKPISA



Further information

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HKPISA

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