

Level and balance of PISA
2006 scores -
with some applications
in the framework of educational equity
account

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PISA RESEARCH CONFERENCE
14.09.2009, Kiel, Germany

Educational Equity Account

Educational equity refers to the impact of contextual factors on educational outcome^[1]. Ideally it should be non-existent. Educational equity is seen to be in balance or to show an educationally relevant positive outcome or 'profit' when relevant contextual factors do not explain any of the variation in students' school attainment, that is, the only source of variation in scholastic attainment would stem from students' individual characteristics.

^[1] The concept of (total) equity is not unproblematic. If education is expected to have a lasting impact on an individual's life it is difficult to see why these should or would not pay dividends in children's lives and future success.

Educational Equity Account

The most essential educational equity factors or factors that have been shown to impede educational equity or the equal realisation of individual educability are **gender, parents' socio-economic or educational status, immigration status, home- and schooling language and, of course, the quality of schools.**

There are also other factors that could be taken into account in estimating national educational equity account in specific areas like in Nordic countries, in Europe, in world.

PISA level and PISA balance

For testing educational equity with the PISA data, two new variables have been constructed to summarise PISA outcomes for a general analysis, *PISA level* and *PISA balance*. To calculate these, principal component analysis was applied to condense the plausible values for science, math and reading for the three PISA domains for each student into two variables^[1]. The correlation of level and balance is by definition zero.

^[1] The PISA data file (www.pisa.oecd.org,) contains five plausible values for each student's science, mathematics and reading competence to allow for a more reliable assessment of standard errors. See www.acer.au and the technical manual of PISA 2006 (OECD, 2009).

PISA level and PISA balance

The first principal component, indicating student's general level of attainment, was named *level*, following Hunt & Wittmann (2008; Wittmann 2004).

The second component, indicating the profile or the relative role of the three different literacies in students' attainment was named *balance*. **Positive values** in balance indicate a performance where reading is relatively stronger in relation to math and science, and **negative values** indicate a performance where math is relatively stronger in relation to reading. Balance is, accordingly, an index for student's competence profile.

The estimates for level and balance are based on the PISA data (OECD 2007) as a whole, that is the means for level and balance for the whole student population of PISA 2006 were zero [in the text tables, only OECD countries were used and are given]

	Level[86%]	Balance[5%]
Plausible value in math	0,92	-0,24
Plausible value in math	0,92	-0,24
Plausible value in math	0,92	-0,24
Plausible value in math	0,92	-0,24
Plausible value in math	0,92	-0,24
Plausible value in reading	0,91	0,31
Plausible value in reading	0,91	0,31
Plausible value in reading	0,91	0,31
Plausible value in reading	0,91	0,31
Plausible value in reading	0,91	0,31
Plausible value in science	0,95	-0,06
Plausible value in science	0,95	-0,06
Plausible value in science	0,95	-0,06
Plausible value in science	0,95	-0,06
Plausible value in science	0,95	-0,06

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
LEVEL	393139	-4,18	3,84	0,00	1,00
Valid N (listwise)	393139				

Explains 86% of the total world variance of science, math and reading PV scores, all PISA 2006 countries included

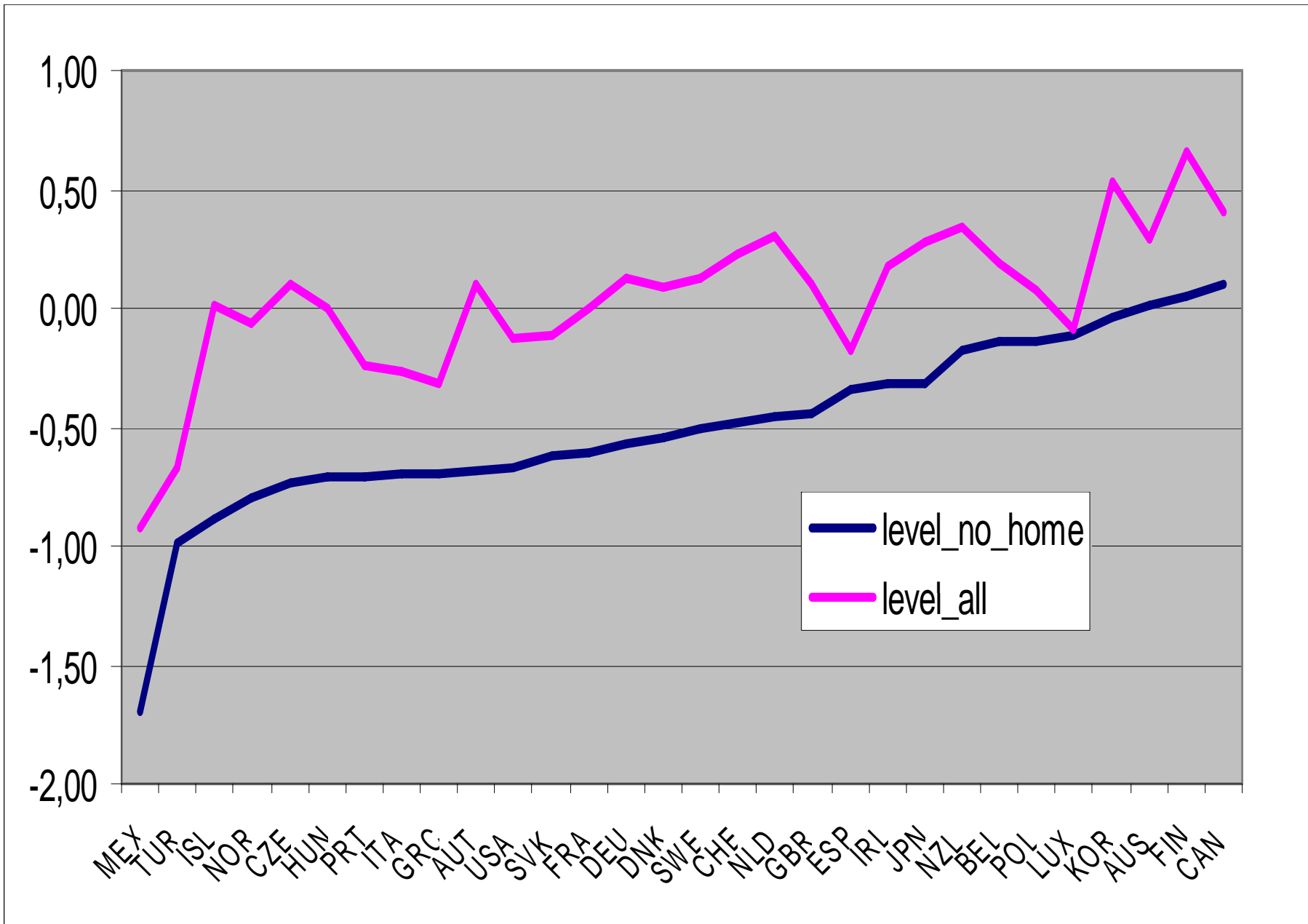
Level and balance

Standard errors and confidence intervals [given in the text] were estimated using complex survey modules of the SAS software, using for means Proc SurveyMeans, for frequencies Proc SurveyFreq and for regression analyses Proc SurveyReg, or in SPSS analyses, the complex sample module.

<i>Country</i>	<i>Mean level</i>	<i>min</i>	<i>max</i>
Canada	.48	-3.2	3
Finland	.84	-2.1	3.1
France	.24	-2.7	2.6
Germany	.4	-3.1	2.8
Korea	.72	-2.6	2.9
Netherlands, The	.58	-1.98	2.9
New Zealand	.57	-2.5	3.2
Spain	.26		3.84
Jordan	-.62	-4.18	
Azerbaijan	-.64	-1.87	1.43

Test-language

- The data include information of
- the testing language (in Finland, Finnish and Swedish),
- the home language (Finnish, Swedish, other).
- We have used coding: test language = home language, test language \neq home language, and have calculated means for level and balance [tables in the text] for OECD countries.



<i>Country</i>	<i>test=home</i>	<i>test≠home</i>	<i>all</i>	<i>diff</i>
NLD	0,37	-0,45	0,31	0,82
GBR	0,14	-0,45	0,10	0,59
ESP	-0,14	-0,35	-0,18	0,21
IRL	0,21	-0,32	0,17	0,52
JPN	0,30	-0,31	0,27	0,61
NZL	0,42	-0,17	0,34	0,59
BEL	0,30	-0,14	0,19	0,44
POL	0,08	-0,13	0,08	0,21
LUX	0,28	-0,12	-0,08	0,40
KOR	0,54	-0,03	0,53	0,57
AUS	0,33	0,01	0,30	0,31
FIN	0,68	0,05	0,66	0,62
CAN	0,46	0,10	0,40	0,36

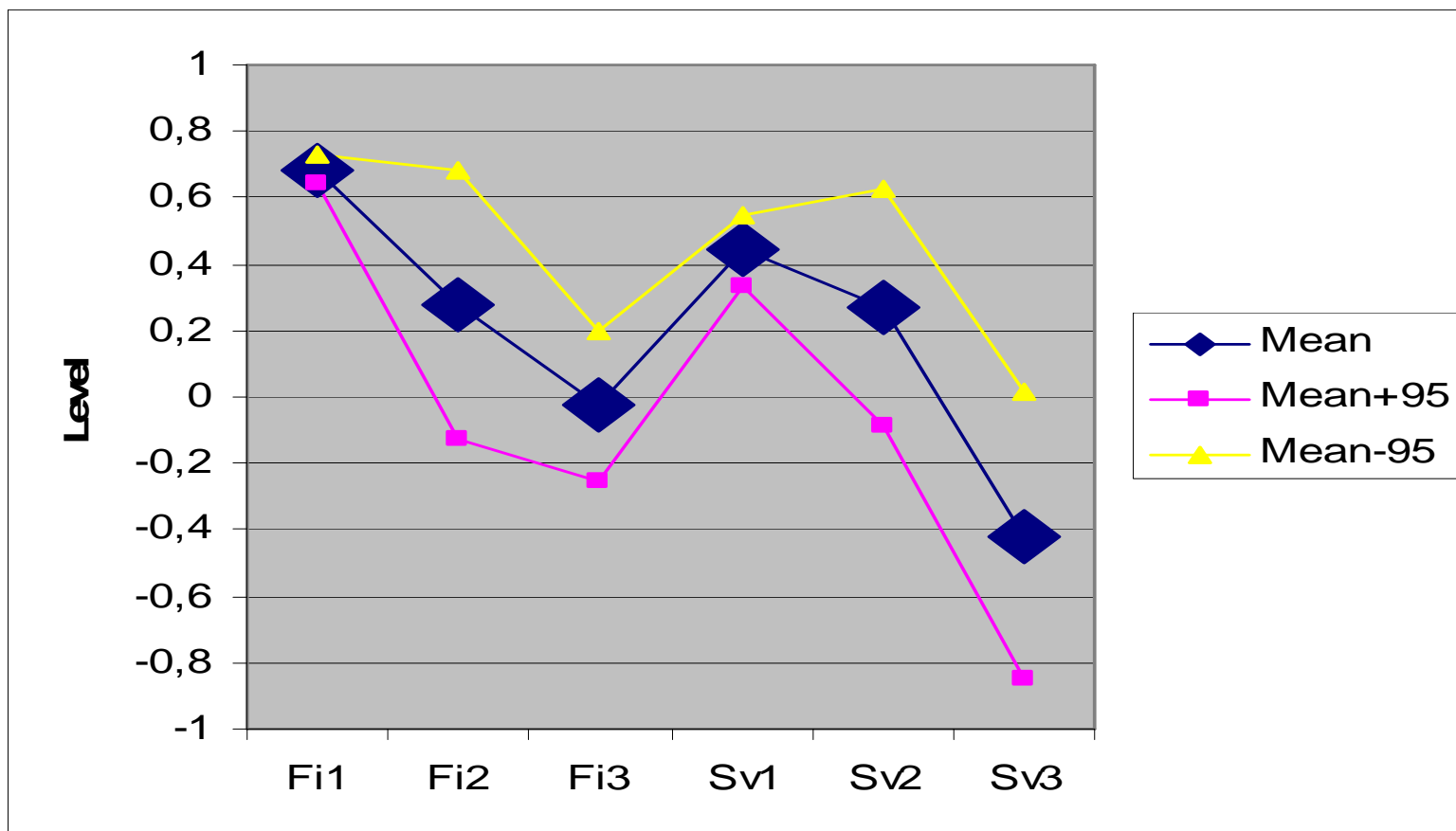
<i>Country</i>	<i>test=home</i>	<i>test≠home</i>	<i>all</i>	<i>diff</i>
Island	0,05	-0,89	0,01	0,93
Norway	0,00	-0,80	0,07	0,81
Denmark	0,16	-0,54	0,09	0,70
Sweden	0,20	-0,51	0,12	0,71
Finland	0,68	0,05	0,66	0,62

Level = A combined Finnish score for PISA Science, Reading and Mathematics

Language of Test & Home Language:

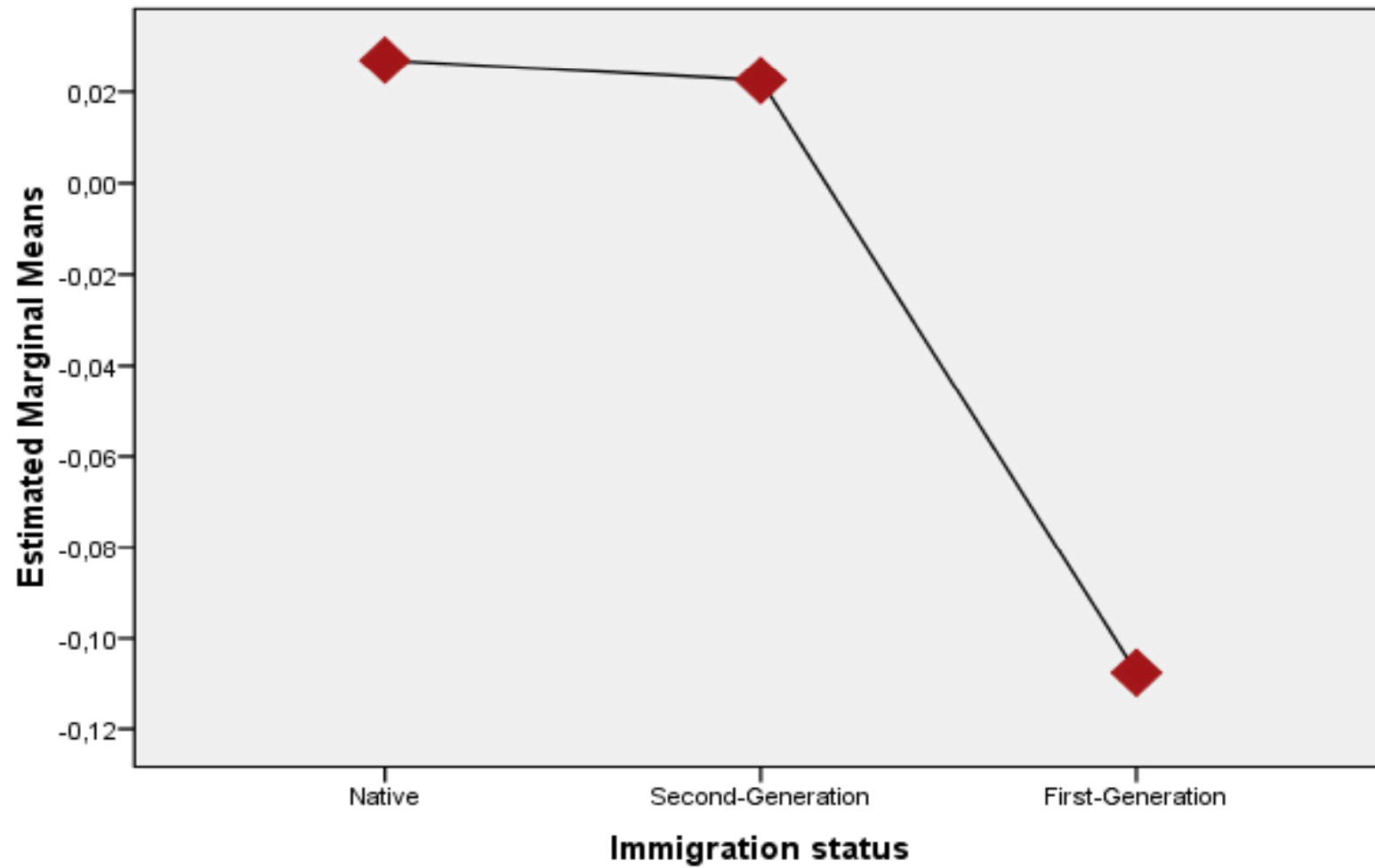
Fi1= Finnish & Finnish, Fi2= Finnish & Swedish, Fi3= Finnish & other

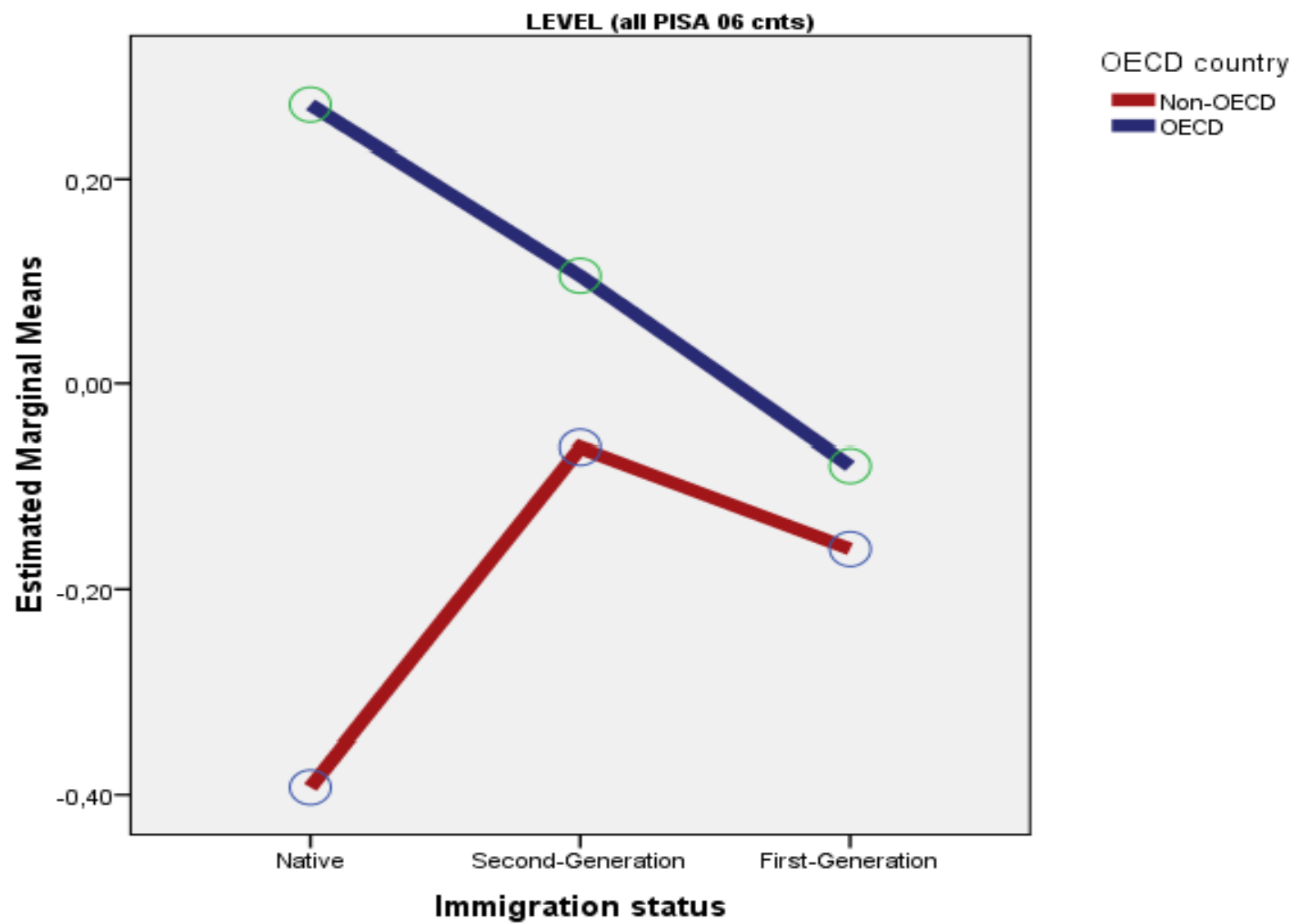
Sv1= Swedish & Swedish, Sv2= Swedish & Finnish, 3= Swedish & other



Immigrants

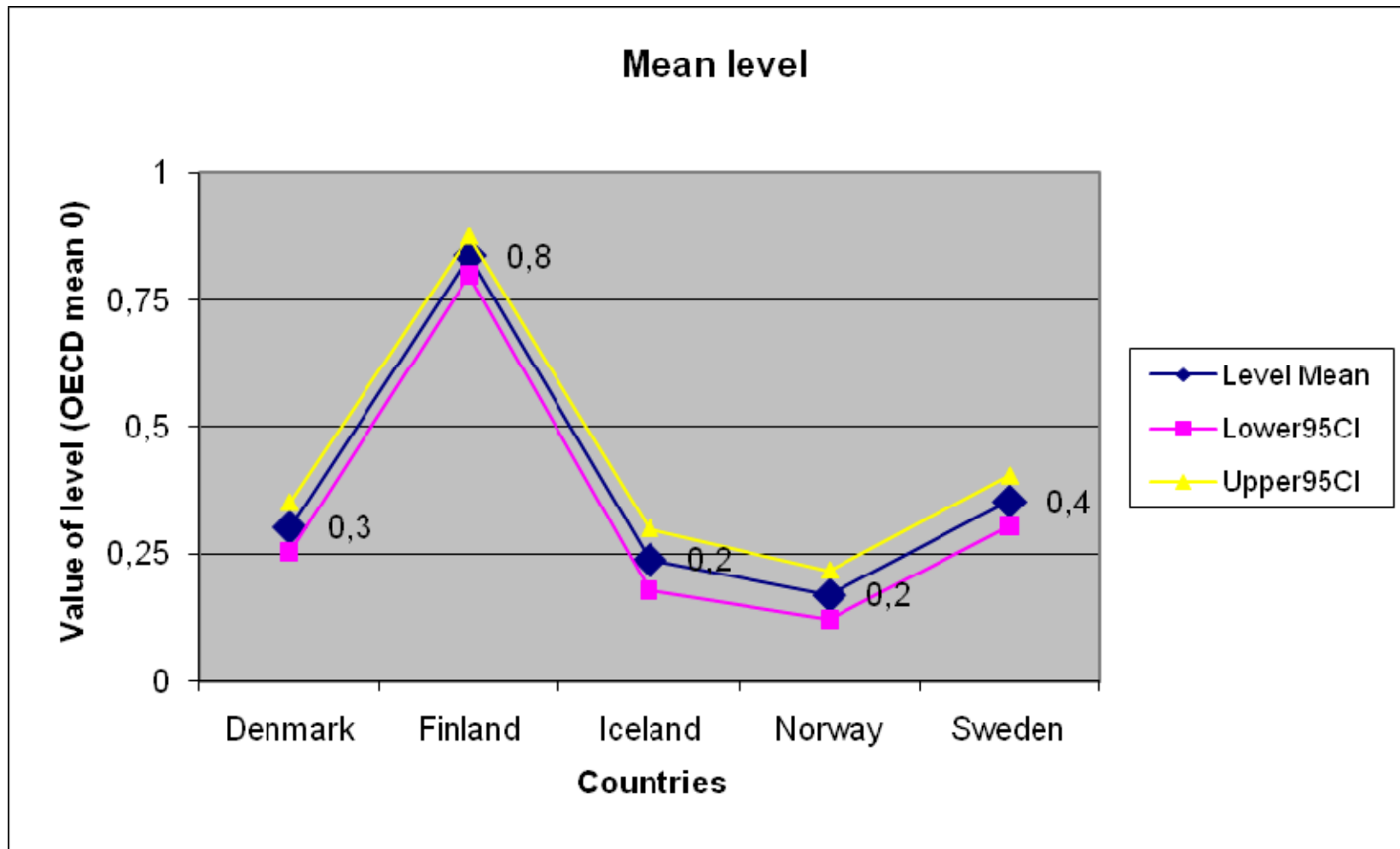
Estimated Marginal Means of LEVEL (all PISA 06 cnts)



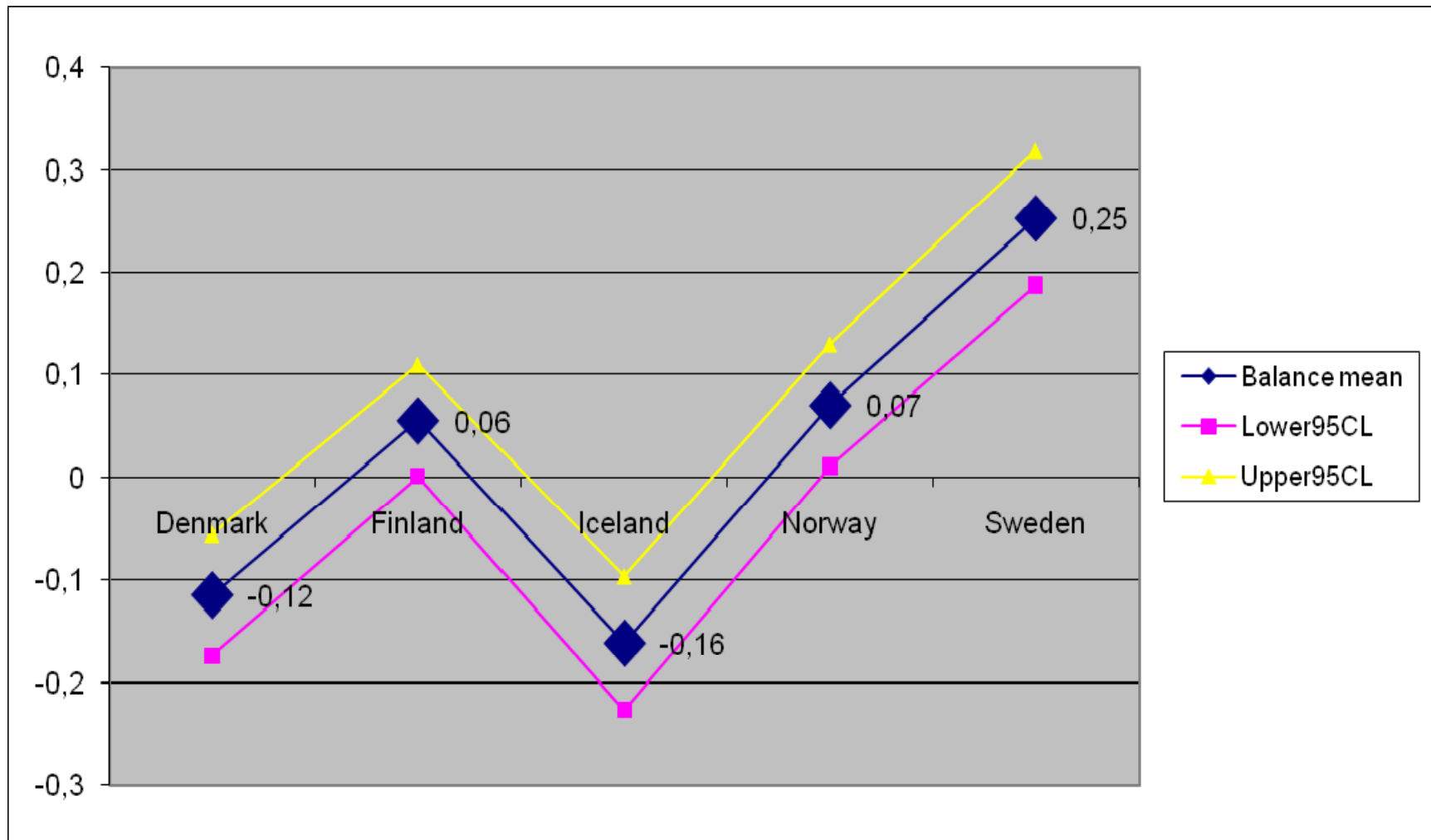


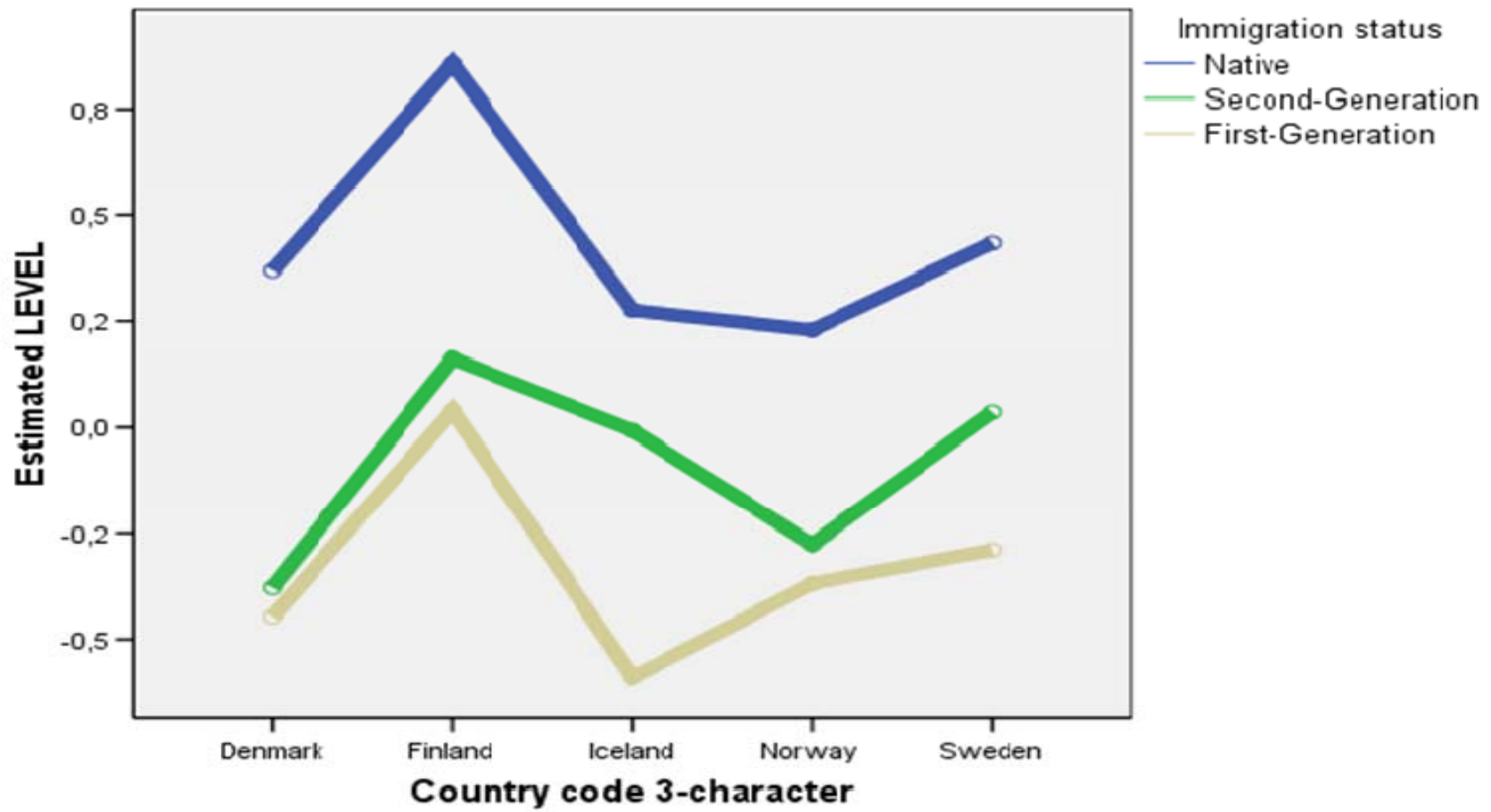
A Nordic example of uses for
level and balance

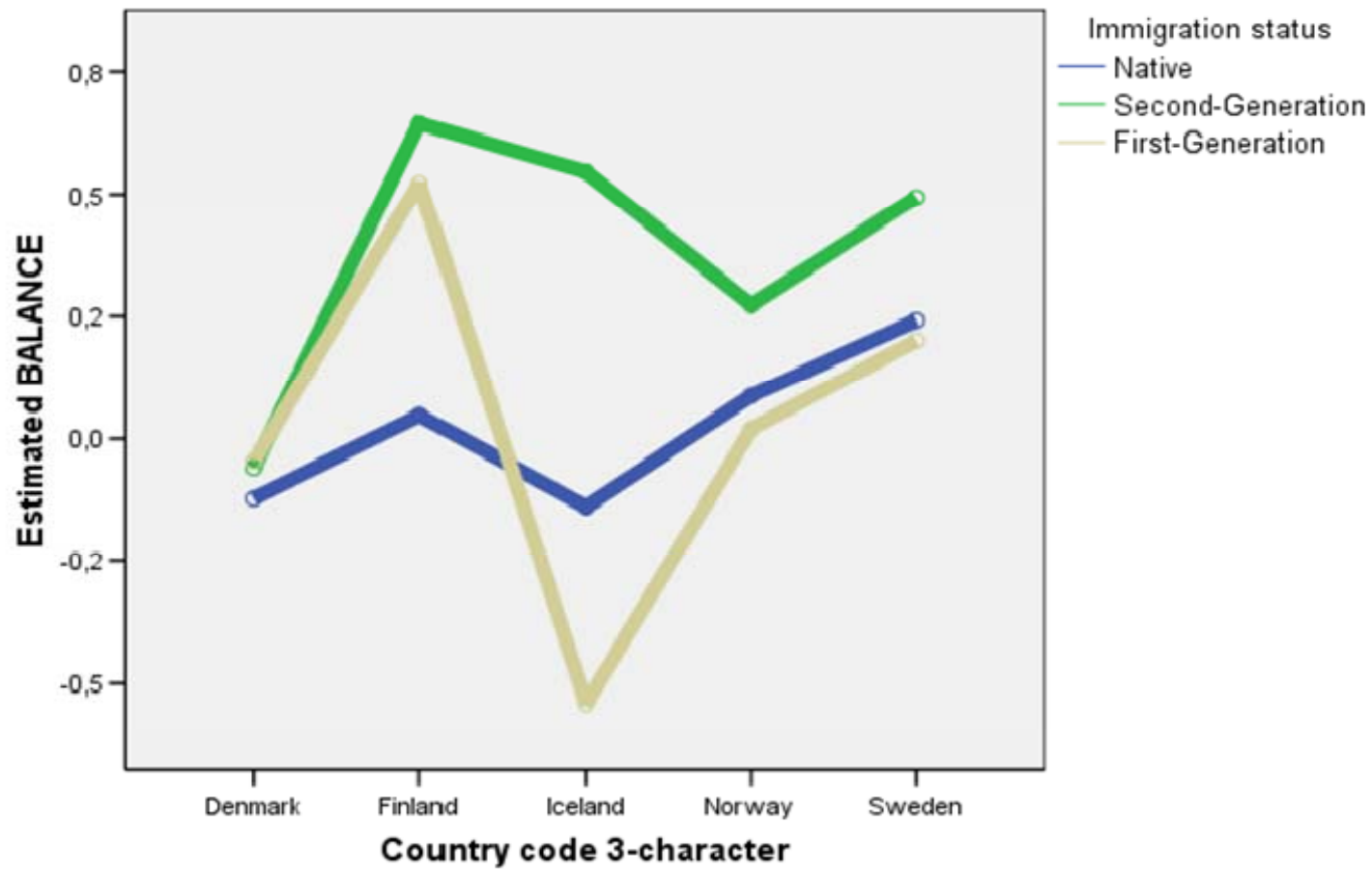
Values of level for the Nordic countries (95% confidence intervals, CI estimated) (World mean of all PISA 2006 countries = 0, SD=1).

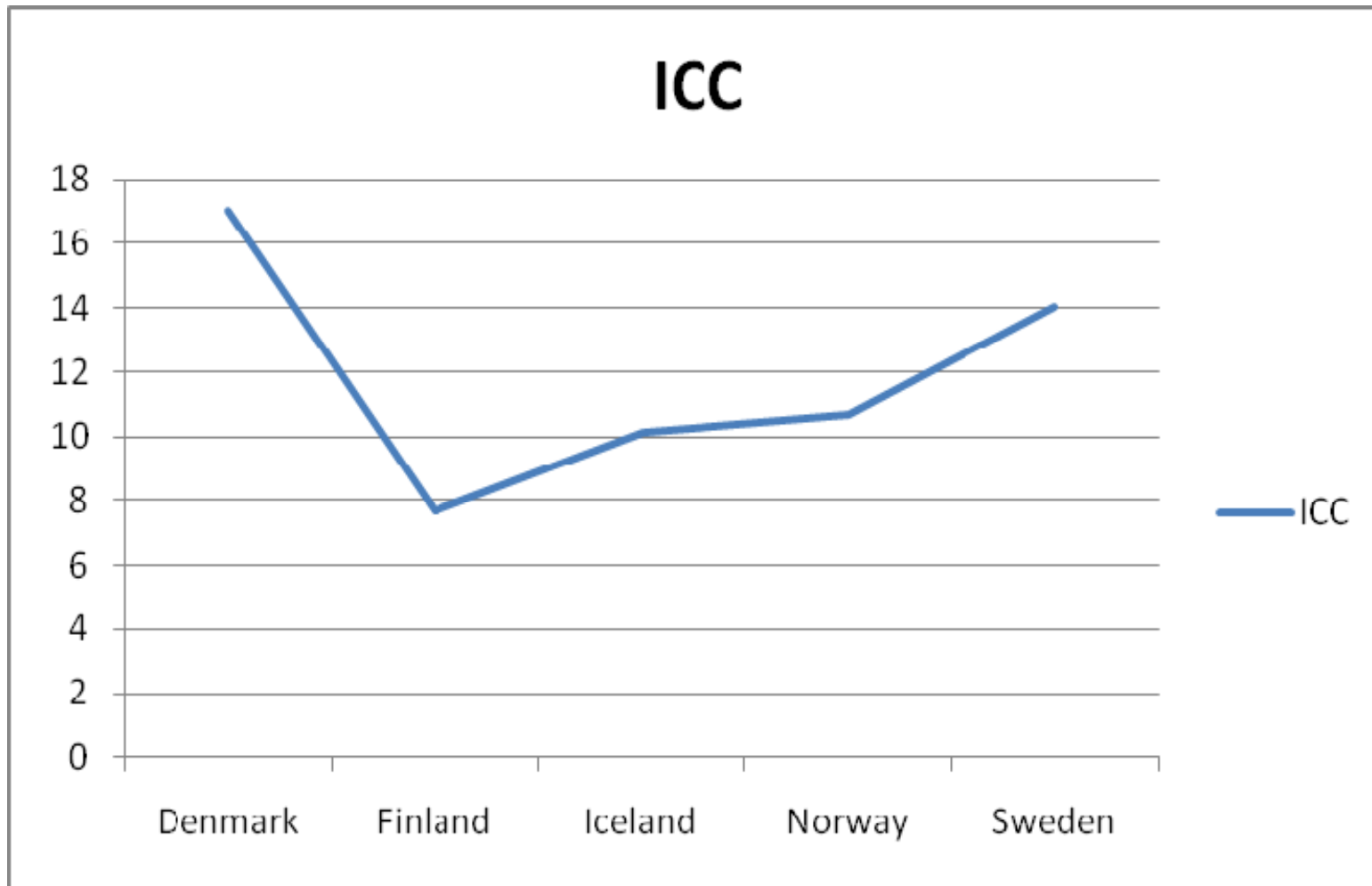


Values of balance for the Nordic countries (95% confidence intervals, CI estimated) (World mean of all PISA 2006 countries = 0, SD=1).



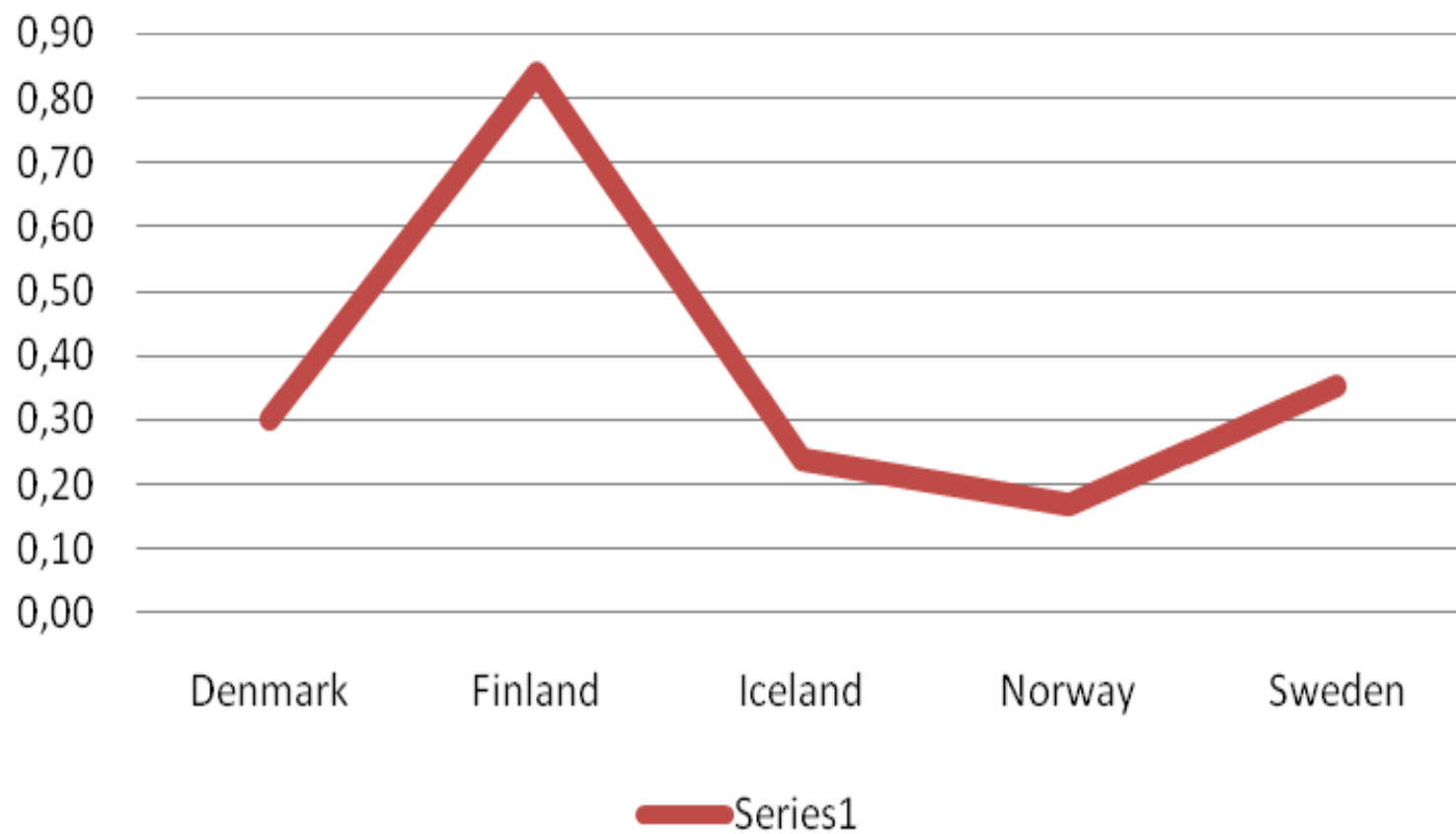




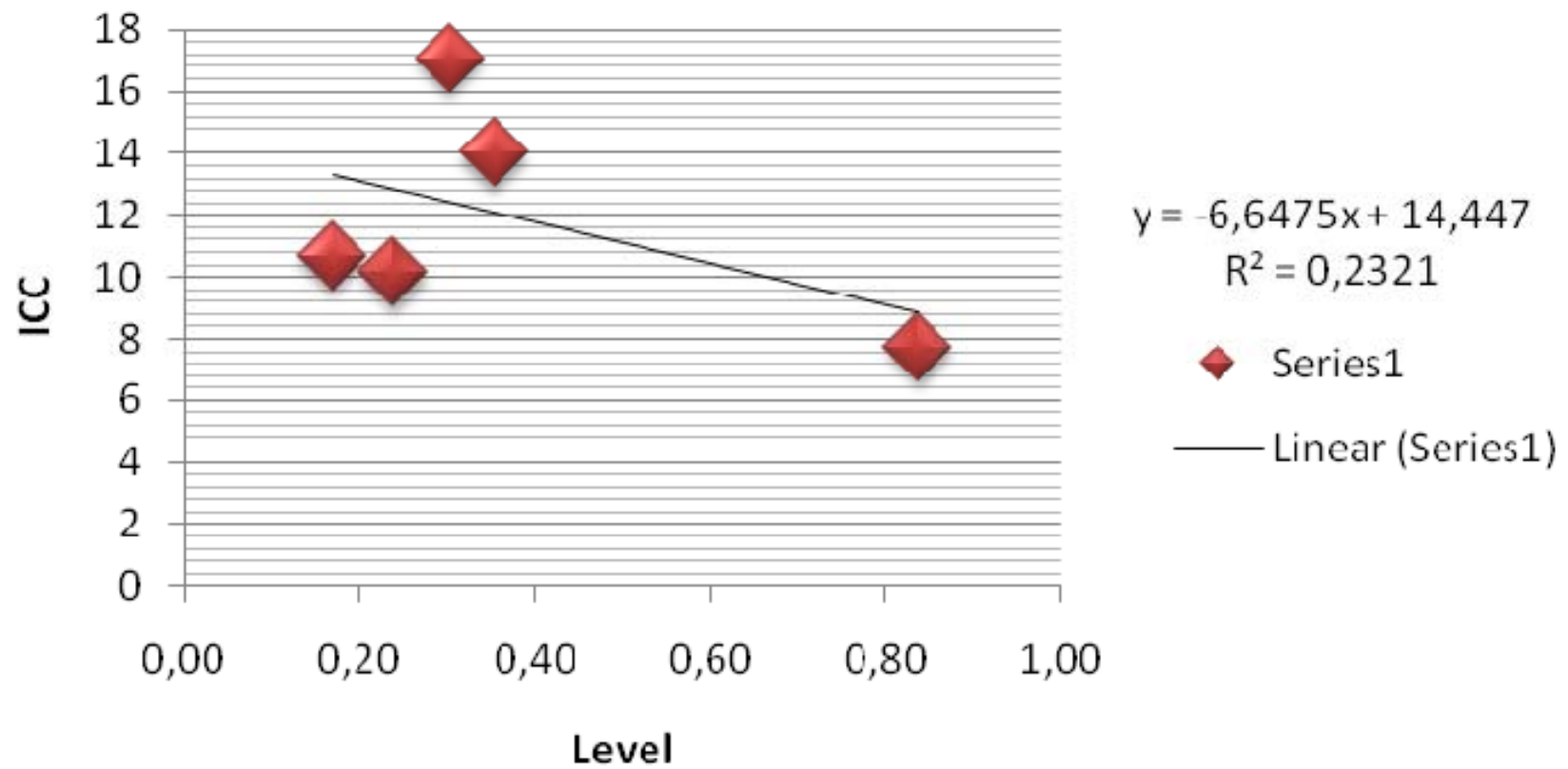


ICC = intra class correlation, i.e, between_school variation of PISA level
Multilevel modeling, MlwiN2.10

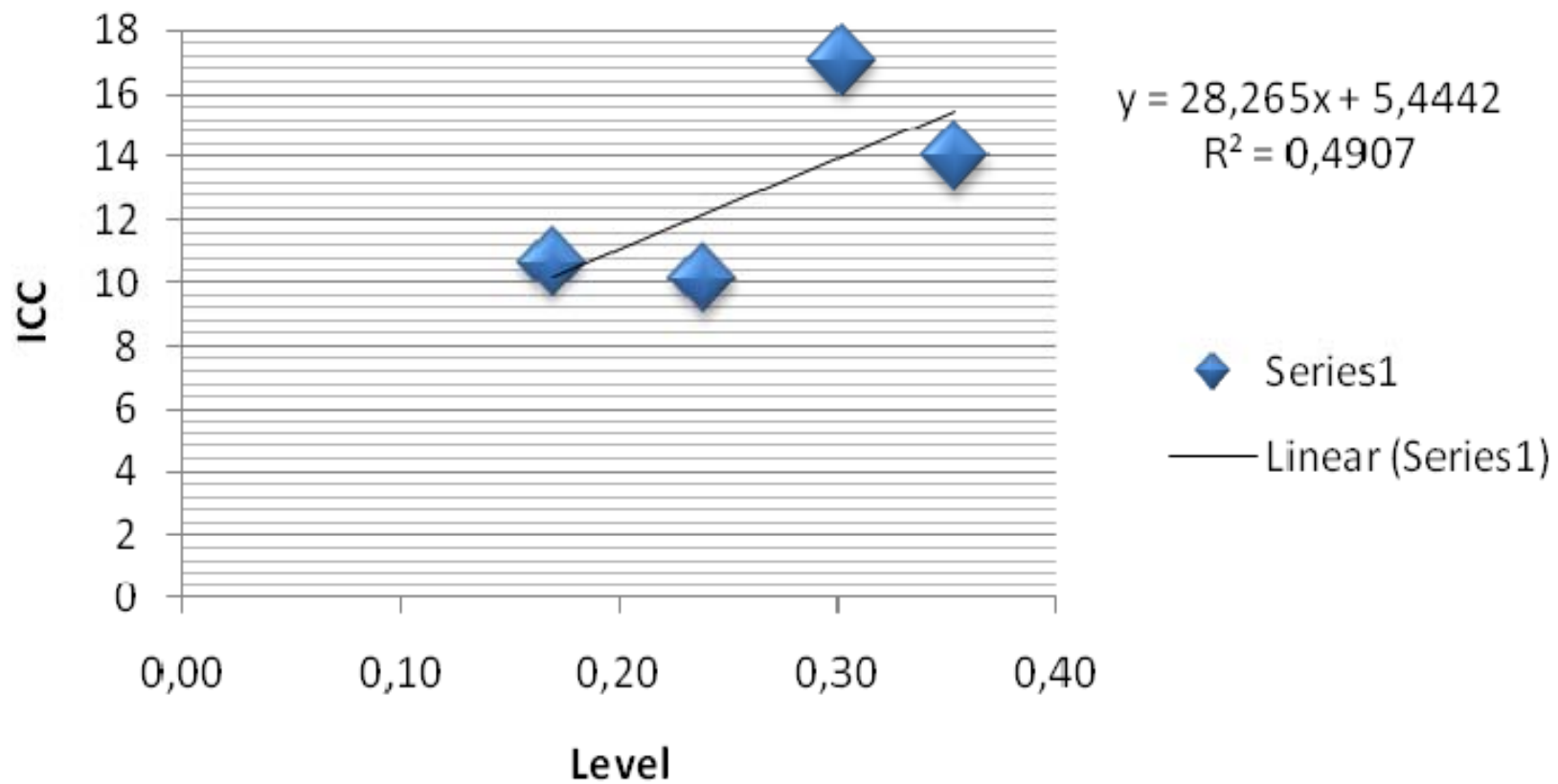
PISA level in Nordic countries



All Nordic countries

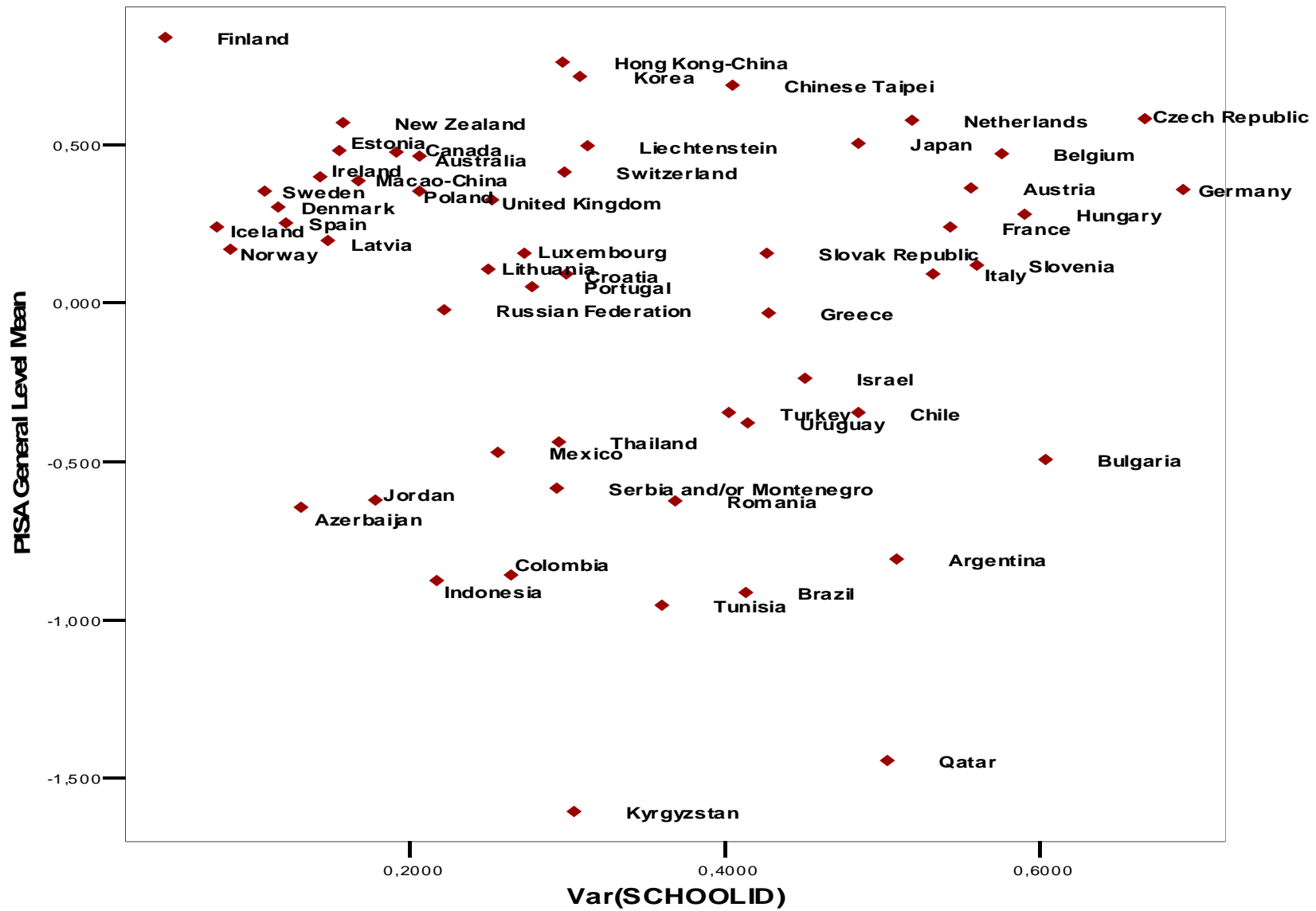


Nordic countries (without FIN)



Comment

- A powerful political issue is whether a segregated/tracked/selected system is better in supporting high performance than *any school for all* - policy
- The answer is NO, if Finland is included,
- but YES, if Finland is excluded
- when Nordic countries is the arena



Symbolic data analysis & PISA 2006

Symbolic maps using SODAS 2.5 software
in Finland:

I have been using material provided by
seppo.laaksonen@helsinki.fi

Symbolic data analysis is a relatively new field that provides a range of methods for analyzing complex datasets. Standard statistical methods do not have the power or flexibility to make sense of very large datasets, and symbolic data analysis techniques have been developed in order to extract knowledge from such data. Symbolic data methods differ from that of data mining, for example, because rather than identifying points of interest in the data, symbolic data methods allow the user to build models of the data and make predictions about future events.

SODAS 2.5

Edwin Diday and Monique Noirhomme-Fraiture, "Symbolic Data Analysis and the SODAS Software." Wiley and Sons: Chichester, UK.

Hbk, 476pp
January 2008
ISBN10: 0470018836
ISBN13: 9780470018835
Price, current list
£85.00 / €119.00 /
\$170.00

