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Changes in Cognitive Capital in Eastern and Western Europe: Some Implications from School Assessment Studies

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Abstract

The article presents an analysis of national differences in the relative increase or decrease in scores on PISA, TIMSS and PIRLS between the year 1995 and the year 2019. We found that former Eastern Bloc countries and former Soviet republics had significantly stronger growth in PISA scores from 2000 to 2018 when the lower, on average, starting levels of school and economic performance are taken into account. However, this finding could hardly be replicated in the case of TIMSS between 1995 and 2019 and PIRLS between 2001 and 2016. We examine possible reasons for this finding, such as differences in the relative decline in cognitive ability between countries, and we explore their implications with regard to where future centres of cognitive capital may be located.

Keywords: school assessment studies, Eastern bloc, former Soviet republics, cognitive capital, cognitive decline
JEL: H75, J24, C3

Introduction

There is a large body of evidence that the average intelligence of a nation, or its cognitive capital (Rindermann, 2018), is robustly associated with its success in economic terms. The much-criticized national IQs (Lynn and Vanhanen, 2012) have been recalculated in order to respond to the various legitimate criticisms that have been levelled against them. These new national IQs correlate with the earlier ones at 0.87 (Lynn and Becker, 2018). These national scores predict numerous markers of socio-economic development

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such as educational attainment, earnings, economic growth rates, Gross Domestic Product, and a number of measures of political stability (Lynn and Vanhanen, 2012; Rindermann, 2018). It has been found that approximately 70% of the variation in wealth between nations can be explained solely by differences in national IQ, considerably more than any other of 70 proposed causes, including issues such as population density and land area. Moreover, the relationship between national IQ and national wealth has been shown to be causal, as evidenced by a correlation of close to 1 between the prevalence of alleles associated with very high levels of educational attainment (and thus with intelligence) and the wealth of nations (Francis and Kirkegaard, 2022).

There is, however, still much debate about whether intelligence or cognitive capital is influenced by wealth or vice versa. Representatives of both the Human Capital Theory and the Cognitive Capital Theory supporting the first path, argue that abilities can stimulate economies, as individuals who are more productive and effective in using resources enhance institutions. This, in turn, creates the prerequisites for a robust economy, fostering technological and scientific innovations and ensuring competitiveness in regional or global markets (e.g., Azam, 2017; Burhan et al., 2014, 2017/a, 2017/b; Coyle et al., 2016, 2018; Rindermann, 2018).

Nevertheless, many researchers remain sceptical of national IQs, though they strongly correlate, at around 0.80, with national scores on international student assessments such as PISA (Lynn and Becker, 2018). In many respects, PISA scores are far more useful than the national IQs because, although they are not actual IQ tests, they tend to draw upon extremely large and highly representative samples, meaning they effectively allow us to interrogate differences in intelligence, or cognitive capital, between nations. As with national IQs, these have been found to robustly correlate with all markers of economic and social development (e.g. Rindermann, 2018; Jones and Potrafke, 2014; Rindermann and Thompson, 2011). There is robust evidence that average intelligence is declining in Western countries, and there are reasons to believe that this is at least partly due to genetic reasons, e.g. weak negative correlation between fertility and intelligence (see Lynn, 2011; Rindermann et al., 2017). There is a negative Flynn Effect on IQ in many Western countries (Dutton et al., 2016) and the original Flynn Effect has shown not to be on g (not a Jensen Effect) and, instead, caused by massive gains on similarities-type subtests which emerged as an IQ gain on the imperfect instruments employed (Flynn, 2012). Once this was pushed to its phenotypic maximum, the underlying IQ decline emerged on these tests and, in some cases, the Negative Flynn Effect was on g (Dutton et al., 2016), though as declining IQ worsens schooling and the like we might predict that the Negative Flynn Effect would also be environmental; a literal Flynn Effect in reverse. Flynn (2012) proposed that the Flynn Effect was caused by society increasingly donning ‘scientific spectacles’ such that, since the 1930s, people have been forced to think in a more scientific way, which causes them to be better at ‘similarities’-type tests. Numerous other correlates expose this intelligence decline including a decline in the prevalence of alleles associated with high levels of education across generations (Kong et al., 2017; Hugh-Jones and Abdelaoui, 2021), lengthening reaction times (Woodley et al., 2013), worsening colour discrimination (Woodley of Menie and Fernandes, 2015), declining per capita major innovation (Woodley, 2012) and declining use of high order words in representative texts (Woodley of Menie et al., 2015; Dutton and Woodley of Menie, 2018).

If IQ is indeed in decline in the developed world then this has massive implications for where the future centres of cognitive capital are likely to be located. Mindful of what appears to be a causal relationship between cognitive capital and national level social and economic development, these student assessment data potentially allow us to explore an important issue with regard to future social and economic development. In the coming generations, which countries are likely to be the wealthiest and the most developed? Even if all developed countries are in IQ decline, which may not even be the case, are some countries declining more quickly than others? It is this vital question – for those interested in future social and economic development – which this study intends to explore.

Method

Data

The affiliation to the Eastern Bloc during the Cold War Era was used to create three independent variables. *Eastern Bloc* is dichotomous and differentiates between countries which were either Soviet republics or members of the Warsaw Pact (coded: 1) and those to which this did not apply (coded: 0). *Soviet* is also dichotomous and differentiates between countries which were Soviet republics (coded: 1) or not (0). *Eastern Block & Soviet* is trichotomous and differentiates between countries which were Soviet republics (coded: 2), members of the Warsaw Pact (coded: 1) or neither (coded: 0).

We used country data from three international school assessment studies (SAS) as variables for the educational level of the population:

(1) From the Programme for International Student Assessment (PISA), cycles 2000 and 2018 (OECD, 2024);

(2) From the Trends in International Mathematics and Science Study (TIMSS), cycles 1995 and 2019 (IEA, 2024/a);

(3) From the Progress in International Reading Literacy Study (PIRLS), cycles 2001 to 2016 (IEA, 2024/b).

Results from the latest PISA cycle in 2022 and the latest PIRLS cycle in 2021 were excluded because they were possibly affected by the COVID-19 pandemic (Bonacini and Murat, 2023; Bryant et al., 2022; OECD, 2020). Results from the various subscales and subsamples were averaged to produce one overall score per study. Changes per country were calculated by subtracting the overall score of the last cycle from the first, named *PISA* (00 to 18), *TIMSS* (95 to 19) and *PIRLS* (01 to 16). Thus, the observed sample of countries per study is limited to those countries participating in the first and latest cycle ($N_{PISA} = 40$; $N_{TIMSS} = 31$; $N_{PIRLS} = 23$). The scores from the first cycles were also used in analyses, named Initial SAS score.

Annual GDP/c PPP for the three start years (1995, 2000, 2001) was used as a proxy for economic performance, named as *Initial log GDP/c PPP*. Country data were taken from World Bank (2023) and logarithmized to correct for growth effects.

All variables and numbers used in the analysis are shown in Table 1. A descriptive statistic for the whole as well as the three subsamples (*Eastern Bloc* = 1, *Soviet* = 1, *Eastern Bloc and Soviet* ≥ 1) is shown in Table 2.

Analysis

To test our hypotheses, we will first use t-tests and ANOVA. This will be followed by more complex methods of multiple regression analyses (MRA) and path analyses.

Our nine models for MRA follow the general formula:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

For path analyses, additional equations were added to model mediator effects:

$$Y_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

$$Y_2 = \beta_0 + \beta_1 X_1 + \epsilon$$

$$Y_3 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

In both MRA and path analyses Y or Y_1 is either PISA (2000 to 2018), TIMSS (1995 to 2015) or PIRLS (2001 to 2016) and X1 is either Eastern Bloc (dich.), Soviet (dich.) or Eastern Bloc and Soviet (trich.). X_2 and X_3 (and Y_2 and Y_3) are always the initial logarithmized GDP/c PPP and the initial SAS score. Analyses were done with R by using the command “cfa(…)” with the parameters: estimator = “EM”, missing = “FIML”, std.ov = TRUE, fixed.x = FALSE, check.gradient = TRUE, and bootstrap = TRUE.

Limitations

Data are not available for the first years after the fall of the Iron Curtain. Therefore, Eastern Bloc countries and former Soviet republics have already had 10 (5 in the case of TIMSS) years to adapt to Western educational standards. On the other hand, for most of the Eastern Bloc states and Soviet republics, the actual integration into international organizations such as the EU and the OECD began much later, i.e. after the year 2000.

Results

We started our analyses with t-tests for the changes in SAS results between subsamples generated by using the two dichotomous variables Eastern Bloc and Soviet. Descriptive statistics initially show differences between the full and the three Eastern Bloc subsamples. For example, the strongest difference (45.90) was found for the change in TIMSS-scores between Soviet- and non-Soviet countries. Except for TIMSS compared between Eastern Bloc and non-Eastern Bloc countries, post-communist countries show more positive changes. However, t-tests found significance only for TIMSS compared between Soviet and non-Soviet countries ($t[30] = -3.923$, $p < .001$). An additional ANOVA for the trichotomous variable Eastern Bloc and Soviet did also not yield significant results (PISA: $F(1, 38)= 2.671$, $MSE = 1565.0$, $p = .110$; TIMSS: $F(1, 28) = 2.213$, $MSE = 1204.1$, $p = .148$; PIRLS: $F(1, 21) = 0.982$, $MSE = 326.7$, $p = .333$).

Multiple regression analyses (MRA) were used to control the effect of the Cold War affiliations for initial economic and school assessment performances. 3x3 models were tested in which one of the three independent variables for the Cold War affiliation and one of the three dependent variables representing changes in PISA, TIMSS and PIRLS were combined. Initial economic performance (log GDP/c PPP) and initial school assessment score were used as controls in each model. The first striking result is that most variance is explained when changes in PISA are used as independent variables, with more than 2/3 of the variance explained in each model. In the case of TIMSS, 41% and 47% of variance is explained by models using the independent variables *Eastern Bloc* or *Soviet*, and 27% by the model using the independent variable *Eastern Bloc and Soviet*. Almost no variance (<5%) is explained in changes in PIRLS. Thus, significant positive effects for Cold War affiliation variable were found just in the case of changes in PISA ($\beta_{EB} = .397$, $\beta_{Sov.} = .256$, $\beta_{EBandSov.} = .430$) and in the case of changes in TIMSS only for the Soviet variable ($\beta_{Sov.} = .541$). However, $\beta > 1.00$ was found for the initial SAS score in each of the three models testing changes in PISA, thus, in case of these models, results have to be carefully interpreted as possibly overestimated.

Fig. 1 is used to 4 show the interaction effects between the variables of those four MRA models in which significant effects of the Cold War affiliation variables have been reported. The affiliation to Soviet or Eastern Bloc is mostly negatively associated with both the initial SAS score ($\beta = -.02$ to $-.13$) and the initial economic performance ($\beta = -.40$ to $-.26$), but positively with the increase in SAS scores ($\beta = .26$ to $.54$). The most striking difference between the models referring to PISA and those referring to TIMSS is the one between the initial SAS scores and the initial economic performances. This effect is a strong positive in the case of PISA ($\beta = .72$ to $.77$) but almost completely disappears in the case of TIMSS ($\beta = .02$).

Discussion

Our results showed that former Eastern Bloc countries and Soviet republics had significantly stronger growth in PISA scores from 2000 to 2018 when, on average, the lower starting levels of school and economic performance are taken into account. However, this finding could hardly be replicated in the case of TIMSS and PIRLS. This difference is likely attributed to the fact that PISA has a stronger focus on competencies which are important for job performance and the economy, whereas TIMSS and PIRLS have greater emphasis on countries' curricula and education processes rather than on human cognitive capital. The latter is also supported by the lack of effect of the TIMSS scores on the economy in 1995.

Potentially, this implies that, based on current trends, in the coming generations the centres of cognitive capital may migrate from Western to Eastern Europe. A counter-trend in this regard in the 'brain drain,' which appears to be ongoing, whereby relatively educated young people from Eastern European countries make their way to Western European countries in pursuit of higher living standards (Golovics, 2019). A prime example of this trend was the significant movement of Polish people to the UK from since around 2002. However, a large number of these people have now returned to Poland as the living standards in their native country have improved markedly relative to those in the UK and, indeed, as the Polish economy booms. This has been termed a 'reverse brain drain' (Chaffin, 2017; Jackson, 2023). As the economies of Eastern European countries significantly improved, relative to those of Western Europe, we would expect to see a similar reverse migration of cognitive capital in relation to other Eastern European countries. Indeed, we might even expect a brain drain from Western European countries to Eastern countries, which would cement the differences in cognitive capital even further. This has a noteworthy historical parallel in that, during the Western Dark Ages, it was noted that many of the most educated people made their way to Byzantium in the east, where civilization had held out to a greater extent (see Dutton and Rayner-Hilles, 2022).

It is unclear why, when taking their lower starting levels into account, PISA scores are increasing faster in Eastern Europe than in Western Europe. However, there is a number of possible related explanations. Most of Western Europe industrialized earlier than Eastern Europe. Western Europe made the demographic transition earlier and, presumably, went into what some researchers dub 'dysgenic fertility' earlier (Lynn, 2011), something also true of Finland which has been found to have the highest average IQ in Europe (Dutton et al., 2014). Accordingly, it may simply be that Eastern Europe has been in intelligence decline for less time than Western Europe and, with the fall of Communism and with concomitant economic progress pushing their intelligence closer to its phenotypic maximum, this is now being seen in PISA which, as we have discussed, is a sound proxy for intelligence. Another possibility is that we are merely seeing a Flynn Effect in Eastern Europe at the same time as the Negative Flynn Effect is seen in a number of Western European countries. This seems unlikely. Dutton et al. (2016) have shown, drawing upon an unpublished Estonian-language thesis (Korgesaar, 2013), that there is a Negative Flynn Effect in Estonia, yet Estonia's PISA scores are improving relative to those of Western European countries.

Of course, this possibility does not rule out a parallel environmental explanation. As noted above, any genetic decline in intelligence will quickly lead to a less stimulating environment which will push people to their phenotypic maximum intelligence to a decreasing extent. In line with this, it has been found that the IQs of young children in Arab nations are only slightly lower than those of Europeans, but the differences increasingly grow as they go through their different education systems, at least partly because education systems in Arab countries are so sub-optimal (Becker et al., 2023; Bakhiet et al., 2018). If this process is, consequently, less pronounced in Eastern Europe than Western Europe then this would also partly help explain our results.

Conclusion

Our findings from PISA performance imply that in Eastern European countries and former Soviet Republics cognitive capital increased more between 2000 and 2018 than in Western Europe, indicating that in the long term, the centers of cognitive capital are shifting from Western Europe to Eastern Europe. However, the reasons for this have not been fully clarified and the findings are limited to PISA results. Clarifying why the results are not apparent in TIMSS and PISA could provide the key to answering the question of the causation.

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Figures and tables

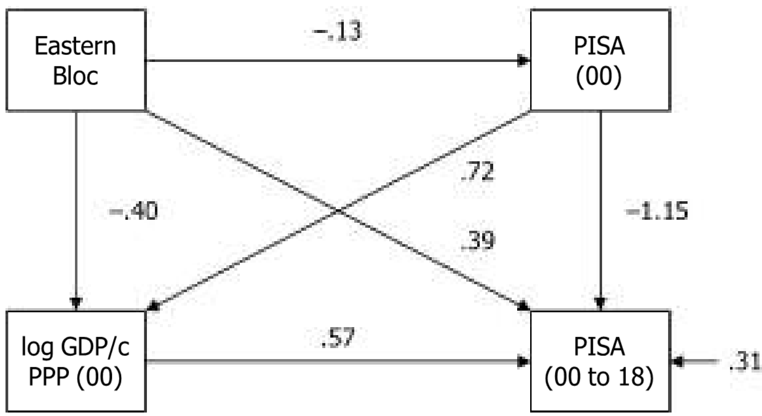

Figure 1. Results from path analyses using *Eastern Bloc* as independent and changes in PISA scores as independent variables
Source: Created by the author

Note: Standardized regression coefficients (β) along paths, residual variance on the right; estimation by FIML (N = 50, missing patterns = 2); bootstrap iterations = 26.

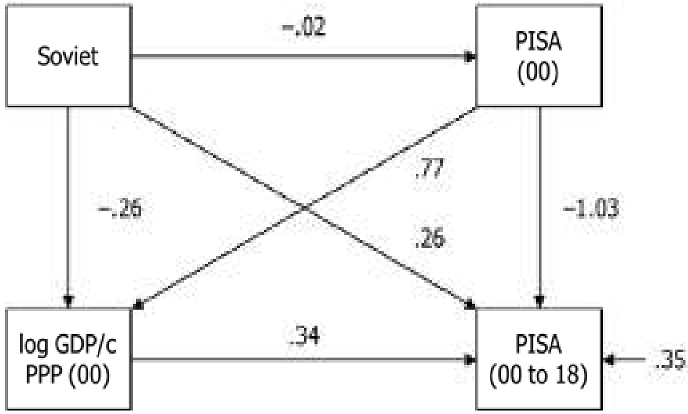

Figure 2. Results from path analyses using *Soviet* as independent and changes in PISA scores as independent variables
Source: Created by the author

Note: Standardized regression coefficients (β) along paths, residual variance on the right; estimation by FIML (*N* = 50, missing patterns = 2); bootstrap iterations = 24.

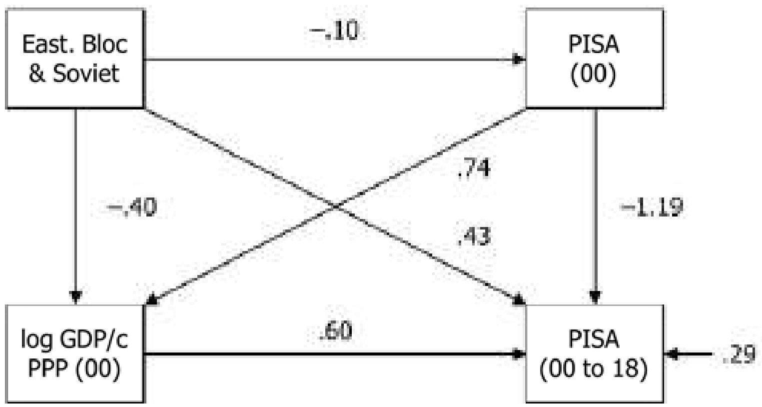

Figure 3. Results from path analyses using *Eastern Bloc and Soviet* as independent and changes in PISA scores as independent variables
Source: Created by the author

Note: Standardized regression coefficients (β) along paths, residual variance on the right; estimation by FIML (*N* = 50, missing patterns = 2); bootstrap iterations = 26.

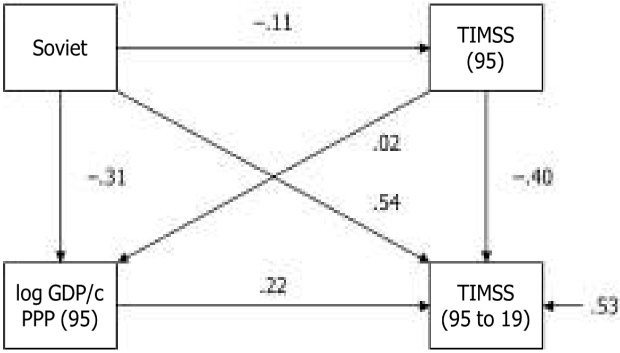

Figure 4. Results from path analyses using *Soviet* as independent and changes in TIMSS scores as independent variables
Source: Created by the author

Note: Standardized regression coefficients (β) along paths, residual variance on the right; estimation by FIML (N = 50, missing patterns = 4); bootstrap iterations = 15.

Table 1. Variables used in analysis

ISO 3166-1 alpha-3	Eastern Bloc	Soviet	Eastern Block and Soviet	PISA (2000)	TIMSS (1995)	PIRLS (2001)	PISA (00 to 18)	TIMSS (95 to 19)	PIRLS (01 to 16)	Log GDP/c PPP (1995)	Log GDP/c PPP (2000)	Log GDP/c PPP (2001)
ALB	1	0	1	368.67	n.d.	n.d.	51.13	n.d.	n.d.	7.89	8.26	8.37
ARG	0	0	0	400.67	n.d.	420.00	–5.66	n.d.	n.d.	9.20	9.35	9.32
AUS	0	0	0	529.67	545.75	n.d.	–30.68	–22.25	n.d.	9.95	10.19	10.23
AUT	0	0	0	513.67	555.25	n.d.	–22.63	–24.75	n.d.	10.07	10.29	10.30
BEL	0	0	0	507.67	528.50	n.d.	–7.76	–12	n.d.	10.02	10.23	10.27
BGR	1	0	1	436.00	552.50	550.00	–9.35	–34.5	2.00	8.95	8.77	8.85
BRA	0	0	0	368.33	n.d.	n.d.	31.69	n.d.	n.d.	8.99	9.10	9.13
CAN	0	0	0	532.00	534.75	544.00	–15.30	–17.25	–1.00	n.d.	10.29	10.32
CHE	0	0	0	506.33	533.50	n.d.	–8.16	n.d.	n.d.	10.34	10.51	10.54
CHL	0	0	0	403.00	n.d.	n.d.	34.75	n.d.	n.d.	8.89	9.16	9.20
CYP	0	0	0	n.d.	478.50	494.00	n.d.	28.5	n.d.	9.75	9.97	10.04
CZE	1	0	1	500.33	565.50	537.00	–4.84	–32	6.00	9.54	9.70	9.78
DEU	0	0	0	487.00	520.00	539.00	13.44	–0.5	–2.00	10.07	10.21	10.25
DNK	0	0	0	497.33	490.00	n.d.	3.72	33.5	n.d.	10.03	10.26	10.29
ESP	0	0	0	486.67	502.00	n.d.	–4.34	4.5	n.d.	9.70	9.98	10.04
FIN	0	0	0	540.00	n.d.	n.d.	–23.58	n.d.	n.d.	9.88	10.20	10.23
FRA	0	0	0	507.33	518.00	525.00	–13.67	–31.75	–14.00	9.94	10.17	10.22
GBR	0	0	0	528.00	524.50	540.50	–24.54	n.d.	18.50	9.93	10.18	10.23

GRC	0	0	0	460.67	492.50	524.00	−7.19	n.d.	n.d.	9.64	9.88	9.95
HKG	0	0	0	542.00	557.50	528.00	−11.29	−3.75	41.00	10.12	10.25	10.27
HUN	1	0	1	488.00	542.75	543.00	−8.67	−18	11.00	9.13	9.38	9.49
IDN	0	0	0	377.00	n.d.	n.d.	4.90	n.d.	n.d.	8.41	8.45	8.50
IRL	0	0	0	514.33	538.50	n.d.	−9.73	−7.75	n.d.	9.85	10.32	10.39
IRN	0	0	0	n.d.	435.75	414.00	n.d.	9	14.00	9.11	9.29	9.32
ISL	0	0	0	505.67	490.00	512.00	−24.27	n.d.	n.d.	10.08	10.30	10.37
ISR	0	0	0	439.67	520.50	n.d.	25.55	−4.5	n.d.	9.89	10.13	10.13
ITA	0	0	0	474.00	n.d.	541.00	2.96	n.d.	7.00	10.02	10.21	10.24
JPN	0	0	0	543.00	586.75	n.d.	−23.01	−7	n.d.	10.08	10.21	10.24
KOR	0	0	0	541.33	595.00	n.d.	−21.67	−6	n.d.	9.51	9.83	9.89
KWT	0	0	0	n.d.	405.75	396.00	n.d.	−0.25	−3.00	10.97	10.99	10.99
LTU	1	1	2	n.d.	476.50	543.00	n.d.	57	5.00	8.69	9.04	9.15
LUX	0	0	0	443.33	n.d.	n.d.	33.39	n.d.	n.d.	10.55	10.92	10.94
LVA	1	1	2	460.33	503.75	545.00	27.03	40.25	13.00	8.62	8.99	9.11
MAR	0	0	0	n.d.	n.d.	350.00	n.d.	n.d.	8.00	7.98	8.19	8.27
MEX	0	0	0	410.33	n.d.	n.d.	5.83	n.d.	n.d.	9.06	9.32	9.33
MKD	0	0	0	385.00	n.d.	442.00	15.05	n.d.	n.d.	8.51	8.72	8.71
NLD	0	0	0	n.d.	558.75	554.00	n.d.	−30.75	−9.00	10.06	10.37	10.41
NOR	0	0	0	501.33	515.50	499.00	−4.39	4.5	18.00	10.10	10.52	10.54
NZL	0	0	0	531.33	515.75	529.00	−28.43	−23	−6.00	9.79	9.98	10.02
PER	0	0	0	317.33	n.d.	n.d.	84.19	n.d.	n.d.	8.39	8.52	8.53
POL	1	0	1	477.33	n.d.	n.d.	35.51	n.d.	n.d.	8.95	9.28	9.32
PRT	0	0	0	461.00	472.25	n.d.	30.99	39.75	n.d.	9.58	9.85	9.88
RUS	1	1	2	466.67	536.50	528.00	14.67	−9.5	53.00	8.63	8.83	8.90

SGP	0	0	0	n.d.	605.50	528.00	n.d.	18.5	48.00	10.47	10.69	10.67
SVK	1	0	1	n.d.	545.50	518.00	n.d.	5.5	17.00	9.07	9.34	9.42
SVN	0	0	0	n.d.	549.75	502.00	n.d.	–30	40.00	9.52	9.80	9.85
SWE	0	0	0	512.67	527.00	561.00	–10.13	n.d.	–6.00	10.05	10.30	10.31
THA	0	0	0	433.00	502.50	n.d.	–20.58	–6.5	n.d.	8.83	8.89	8.94
USA	0	0	0	498.67	536.00	542.00	–3.34	n.d.	7.00	10.26	10.50	10.52

Source: Created by the author

Note: Coding: *Eastern Bloc* = 1 represent countries which were either Soviet republics or members of the Warsaw Pact, *Soviet* = 1 represent countries which were Soviet republics, *Eastern Block and Soviet* = 1 represent countries which were members of the Warsaw Pact and *Eastern Block and Soviet* = 2 represent countries which were Soviet republic.

Table 2. Descriptive statistics

Variables	All			Eastern Bloc			Soviet		
	N	M	SD	N	M	SD	N	M	SD
PISA (2000)	40	472.42	57.15	7	456.76	43.97	2	463.50	4.48
TIMSS (1995)	37	522.78	40.60	8	525.88	33.26	3	505.58	30.04
PIRLS (2001)	29	508.98	52.76	8	534.50	13.74	3	538.67	9.29
PISA (00 to 18)	40	1.79	24.72	7	15.07	23.87	2	20.85	8.74
TIMSS (95 to 19)	31	–2.88	23.43	8	–1.03	35.32	3	38.58	19.30
PIRLS (01 to 16)	23	11.63	18.23	7	15.29	17.40	3	23.67	25.72
Log GDP/c PPP (1995)	49	9.50	0.71	10	8.81	0.44	3	8.65	0.04
Log GDP/c PPP (2000)	50	9.74	0.72	10	9.03	0.42	3	8.95	0.11
Log GDP/c PPP (2001)	50	9.78	0.71	10	9.12	0.41	3	9.06	0.13

Source: Created by the author

Note: Coding - *Eastern Bloc* = countries which were either Soviet republics or members of the Warsaw Pact, *Soviet* = countries which were Soviet republics.

Table 3. Results from t-test

Pairing	Variable	Levene Test		Dif.	t-test		
		F	p		t	df	p
Eastern Bloc	PISA (00 to 18)	0.113	.739	16.09	–1.595	38.00	.119
	TIMSS (95 to 15)	4.542	.042	3.49	–0.190	8.41	.854
	PIRLS (01 to 16)	0.537	.472	5.25	–0.627	21.00	.537
Soviet	PISA (00 to 18)	0.726	.400	20.06	–1.122	38.00	.269
	TIMSS (95 to 15)	0.334	.856	45.90	–3.923	20.00	<.001
	PIRLS (01 to 16)	0.202	.657	13.84	–1.241	21.00	.228

Source: Created by the author

Notes: Negative t-scores represent stronger increases in Eastern Bloc or Soviet countries.

Table 4. Results from MRA for three models using the independent variable *Eastern Bloc*

Variables	PISA (00 to 18)			TIMSS (95 to 15)			PIRLS (01 to 16)		
	B	*S.E.*	*P*	β	*S.E.*	*p*	β	*S.E.*	p
Eastern Bloc	.394	0.121	.001	–.245	0.238	.267	.088	0.271	.749
Init. log GDP/c PPP	.569	0.187	.002	–.480	0.316	.101	–.073	0.320	.821
Initial SAS score	–1.158	0.154	<.001	–.385	0.144	.005	–.033	0.249	.896
R^2		.691			.406			.021	

Source: Created by the author

Note: N = 50; changes in school assessment scores as dependent variables (first line); missing data treated with FIML.

Table 5. Results from MRA for three models using the independent variable *Soviet*

Variables	PISA (00 to 18)			TIMSS (95 to 15)			PIRLS (01 to 16)		
	B	*S.E.*	*P*	β	*S.E.*	*p*	β	*S.E.*	*p*
Soviet	.256	0.112	.021	.541	0.122	<.001	.298	0.168	.252
Init. log GDP/c PPP	.344	0.168	.038	.224	0.181	.246	.006	0.250	.983
Initial SAS score	–1.028	0.153	<.001	–.400	0.117	.001	–.070	0.214	.750
R^2		.654			.465			.039	

Source: Created by the author

Note: N = 50; changes in school assessment scores as dependent variables (first line); missing data treated with FIML.

Table 6. Results from MRA for three models using the independent variable *Eastern Bloc and Soviet*

Variables	PISA (00 to 18)			TIMSS (95 to 15)			PIRLS (01 to 16)		
	B	*S.E.*	*P*	β	*S.E.*	*p*	β	*S.E.*	p
East. Bloc and Soviet	.430	0.119	<.001	.304	0.213	.168	.216	0.239	.377
Init. log GDP/c PPP	.597	0.182	.001	.104	0.299	.735	.056	0.313	.862
Initial SAS score	–1.185	0.151	<.001	–.455	0.141	.002	–.106	0.242	.672
R^2		.705			.271			.034	

Source: Created by the author

Note: N = 50; changes in school assessment scores as dependent variables (first line); missing data treated with FIML.