The impact of the 1999 Polish educational reform: did socio-economic disparities in academic achievements narrow?

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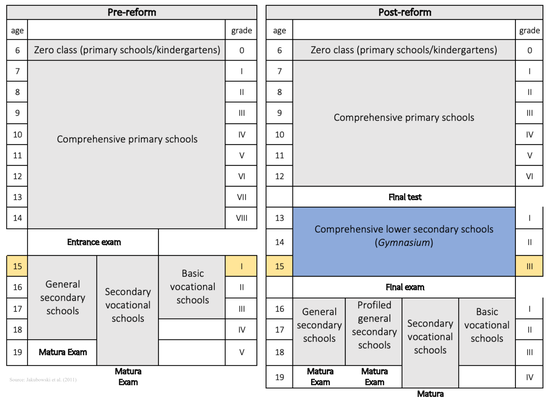
Overview

In Poland, as in many post-socialist countries, the 1990s marked a period of transition from a centrally planned system to a free market economy, which brought about significant changes in all sectors of the economy, including education. Due to the liberalization and privatization, the previously centrally managed schooling system, which placed greater emphasis on vocational training, required adjustments to meet the rapidly growing demands of the Polish labour market. A widening gap between students from different socioeconomic backgrounds and variations in the quality of teaching posed a concern for the future of schools. To address these problems, the 1999 Education Reform was introduced to raise educational attainment, support improvements in teaching quality, and ensure equal educational opportunities.



Source: Jakubowski et al. (2011)

Edition	PISA 2000	PISA 2003	PISA 2006	PISA 2009	PISA 2012	PISA 2015	PISA 2018	PISA 2022
Year	99/00	02/03	05/06	08/09	11/12	14/15	17/18	21/22
Major domain assessed	Reading	Mathematics	Science	Reading	Mathematics	Science	Reading	Mathematics

Timeline: Pre-Reform | Post-Reform | Post De-Reform

The reform was multidimensional and included changes of both a structural and comprehensive nature. However, the introduction of a lower secondary school called 'Gymnasium,' which transformed the schooling structure from a two-stage to a three-stage system by extending general education by one year, constituted a central element of the transformation. This change had the potential to equip students with additional skills, promote social mobility for marginalized students, and advance equity in resource distribution and opportunities in society.

Research significance

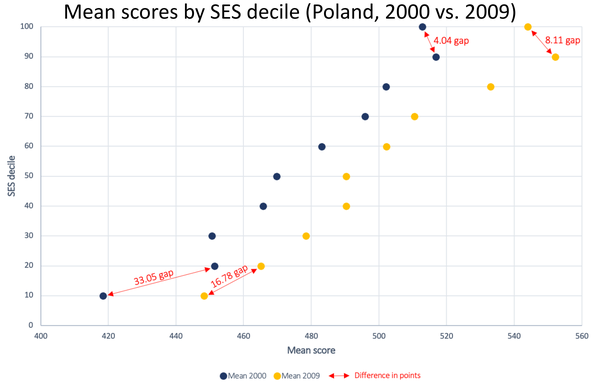
The significance of education for social progress and economic development demonstrated by Becker (1964) or Heckman (2006) is indisputable. Schools play a crucial role in allocating individuals within the social structure and can either reinforce or weaken the impact of socioeconomic status (SES) on student performance. Therefore, narrowing the achievement gap is a shared objective across many education systems.

In 2017, the Law and Justice government reversed the 1999 Polish Reform, citing its perceived ineffectiveness in improving educational equality. The need for more consensus among economists underscores the significance of quantifying its impact on the achievement gap. The insights from this research, utilizing more current data, can contribute to the ongoing discourse.

Data & Descriptive analysis

The study uses the combined editions of the OECD's Programme for International Student Assessment (PISA) **to quantify the reform's effect on academic results across students of diverse socioeconomic backgrounds**. PISA evaluates 15-year-olds' reading, mathematics, and science literacy and provides comprehensive student background information combined into an ESCS variable representing the Index of socioeconomic status.

Mean scores by SES decile (Poland, 2000 vs. 2009)



Note that x-axis does not commence on 0 for the clarity of trends presentation.

Plotting mean scores by ESCS deciles reveals a significant performance gap between the bottom ten and twentieth percentiles in 2000, suggesting a pronounced disadvantage. The gap is narrowing by 2009, after the reform introduction. The change is less evident for the top deciles across this period in nominal terms.

Methodology

1. OLS regression with categorized SES

$$score^i = \beta_0^i + \beta_1^i \cdot ses_{LOW}^i + \beta_2^i \cdot ses_{HIGH}^i + \beta_3^i \cdot gender^i + \beta_4^i \cdot age^i + \beta_5^i \cdot language^i + \varepsilon^i$$

VARIABLES	Pre-reform 2000	Post-reform 2003	Post-reform 2006	Post-reform 2009	Post-reform 2012	Post-reform 2015
Bottom 10% SES	-64.35***	-64.07***	-67.06***	-55.66***	-53.07***	-52.13***
	(7.861)	(4.489)	(4.631)	(4.283)	(4.535)	(4.245)
Top 10% SES	51.09***	68.01***	71.53***	48.92***	52.09***	52.62***
	(7.481)	(4.912)	(4.722)	(5.034)	(5.520)	(4.882)
Gender	33.72***	38.59***	43.56***	49.70***	42.07***	29.65***
{=1 if Female}	(7.324)	(2.945)	(2.983)	(2.373)	(2.922)	(2.697)
Age (incl. months)	10.57*	9.050*	10.60**	8.111**	14.79***	2.183
	(5.721)	(4.609)	(4.759)	(4.109)	(4.769)	(5.008)
Language at home	-57.88**	-0.435	-46.65*	-53.70***	-14.04	-52.35***
{=1 if not Polish}	(22.50)	(21.73)	(26.35)	(16.32)	(14.37)	(14.00)
Constant	299.6***	334.5***	320.8***	350.7***	266.2***	458.1***
	(91.12)	(72.39)	(74.79)	(64.88)	(74.86)	(78.72)
Observations	3,557	4,346	5,456	4,874	4,524	4,467
R-squared	0.104	0.133	0.130	0.149	0.129	0.102

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

$H_0 = \Delta\beta^{Bottom10\%} = \Delta\beta^{Top10\%}$ $\quad t_{2000-2009}^{Bottom\ 10\%} = \frac{-55.66 - (-64.35)}{\sqrt{4.283^2 + 7.861^2}} = 3.57 > critical\ t-value = 2.009$

$H_1 = \Delta\beta^{Bottom10\%} \neq \Delta\beta^{Top10\%}$ $\quad t_{2000-2009}^{Top\ 10\%} = \frac{48.92 - 51.09}{\sqrt{5.034^2 + 7.481^2}} = -0.51 < critical\ t-value = 2.009$

Findings

In the 2000 vs. 2009 comparison, the t-value is significant for the Bottom 10% SES group, but not for the Top 10%, suggesting that the reform had a substantial effect on reducing the performance disparity between the two SES groups. While these results imply disparity reduction, causal inferences require more sophisticated methodologies.

2. Causal inference method: Difference-in-Difference (DD)

$$ATT = E[Y_{it}|T_t = 1, D_i = 1] - E[Y_{it}|T_t = 0, D_i = 1] \quad \text{where } T_t = 1\{\text{after 2000}\} \quad \text{and } D_i = \begin{cases} 1 \text{ Poland} \\ 0 \text{ Czechia} \end{cases}$$

Simplified model without controls for conceptual clarity.

VARIABLES	All no controls Model 1	All w/controls Model 2	Bottom 10% SES Model 3	Bottom 25% SES Model 3	Top 10% SES Model 4	Top 25% SES Model 4
Poland	-6.824	1.609	13.41*	6.894	-15.88**	-9.493
	(6.133)	(4.611)	(7.631)	(5.852)	(6.509)	(5.809)
Post-reform	-3.981	-7.741***	6.135	-2.463	-5.774	-8.457**
	(3.914)	(2.968)	(5.983)	(4.127)	(4.741)	(4.004)
Poland x post-reform	26.71***	24.50***	15.68*	22.81***	28.90***	23.93***
	(6.518)	(4.922)	(8.118)	(6.358)	(7.407)	(6.462)
SES		39.33***	41.93***	42.42***	-12.86***	24.21***
		(0.782)	(3.685)	(2.699)	(4.768)	(2.470)
Gender		37.78***	41.99***	40.06***	39.93***	36.64***
		(1.197)	(2.708)	(1.788)	(2.663)	(1.790)
Language		-52.08***	-34.22***	-39.72***	-53.60***	-55.34***
		(3.992)	(7.449)	(6.327)	(11.11)	(7.411)
Constant	490.2***	489.7***	467.2***	480.9***	559.4***	513.0***
	(3.397)	(2.663)	(7.946)	(4.974)	(6.377)	(3.981)
Observations	90,602	88,553	8,810	22,082	8,865	22,169
R-squared	0.011	0.187	0.113	0.102	0.075	0.076

Findings

The model demonstrates the positive impact of the reform on academic performance in Poland compared to the control group. However, it does not significantly alter socioeconomic status (SES) disparities, as the Bottom 10% effect only reaches significance at p < 0.01. Perhaps the impact is more pronounced in specific years, potentially overshadowed by the overall average?

DD is a central tool for analysing the causal impact of public interventions, popularized by Card & Krueger (1994). It identifies the difference between the actual outcome and a counterfactual, relying on assumptions of independence of observations, parallel trends, no spillovers, and no pre-emptive behaviour. In this model, Czech Republic is employed as the control group. This choice is justified by the geographic proximity, exposure to common aggregate shocks, simultaneous EU joining (2004), the use of individual currencies, and comparable education systems. The conceptual argument is usually supported by graphical verification of parallel trends, which in this case cannot be conducted due to one pre-treatment observation.

3. Dynamic Difference-in-Difference

VARIABLES	All w/controls Model 1	25% Bottom SES Model 2	25% Top SES Model 3
Poland x 2003	16.49**	12.43	23.73**
	(7.716)	(10.83)	(9.963)
Poland x 2006	33.32***	25.51**	29.51***
	(8.795)	(11.83)	(10.70)
Poland x 2009	32.26***	29.34***	35.77***
	(8.032)	(10.93)	(10.49)
Poland x 2012	29.93***	30.61***	23.38**
	(8.021)	(11.13)	(10.59)
Poland x 2015	23.08***	28.68***	16.21
	(7.839)	(10.96)	(10.13)
Poland x 2018	16.43**	8.599	21.28**
	(7.785)	(10.84)	(10.52)
Poland x 2022	-0.502	-5.461	1.838
	(8.063)	(11.26)	(10.48)
SES	41.04***	54.51***	28.93***
	(0.743)	(2.347)	(2.437)
Gender	37.76***	39.77***	36.76***
	(1.177)	(1.757)	(1.788)
Language	-49.07***	-32.42***	-55.14***
	(3.876)	(6.318)	(7.455)
Constant	500.4***	509.7***	515.0***
	(4.083)	(6.983)	(4.986)
Observations	88,553	22,082	22,169
R-squared	0.194	0.111	0.083

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

For all $t = 0,1,2,\ldots,T$

$Y_{it}(1) - Y_{it}(0) = \tau_{it}$

$s = t - S_i$

$Y_{it} = \psi D_i + \delta_t + B_1\{s \geq 0\} + \epsilon_{it}$

Where ψ is the treatment effect

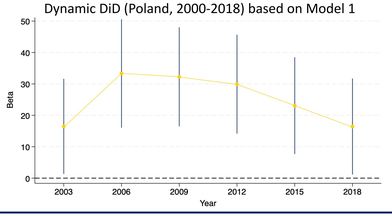
δ_t is the time fixed effect

S_i is the time period when treatment was first received (helps to normalize event-time)

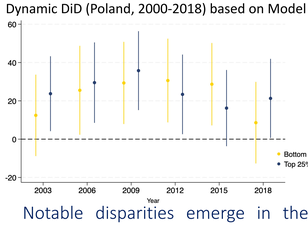
Simplified model without controls for conceptual clarity.

To assess the temporal variation in the impact of the reform, a time fixed effect is introduced into the equation.

Dynamic DiD (Poland, 2000-2018) based on Model 1



Dynamic DiD (Poland, 2000-2018) based on Model 2 & 3



Notable disparities emerge in the time-specific reform effects. The positive impacts of the reform are evident since its inception, benefiting both groups. **Up to 2009**: The effects are more pronounced, notably influencing the Top 25% SES group.

From 2012 to 2015: The favourable effects on Bottom 25% SES students outweigh those for high SES counterparts. But subsequent t-test analysis reveals that this difference is not statistically significant. This suggests that there is insufficient evidence to support the claim that the reform's impact significantly varies between the two groups during this period. **In 2018**, a noticeable reversal in the trend occurs, with a significant reduction in the positive effect.

Conclusions & Next steps

The findings indicate a substantial positive impact of the reform on academic performance in Poland, especially among students from the top ten percentiles of the socioeconomic spectrum, thereby not effectively narrowing the achievement gap. The dynamic DD model shows evidence of temporal dynamics, with the effects being most pronounced ten years after the reform, indicating a time lag in realizing the positive outcomes. This delayed response underscores the need for long-term evaluations to understand the complex impacts of educational policies on academic achievement across socioeconomic groups. Nevertheless, the presence of only one pre-treatment period limits a comprehensive examination (graphical argument) of the parallel trend assumption, potentially impacting the accuracy of the findings. The Synthetic Control Approach, transitioning the emphasis from identifying a parallel country to the challenge of constructing a robust synthetic control and interpreting its implications, presents a logical progression for extending this research. As a next step, a thorough examination of the post-de-reform period (2017) and the impacts of COVID-19 will be undertaken, utilizing an analogical model (DD) for subsequent years. The aim is to assess how these factors influence disparities in academic achievements and formulate policy implications relevant to the current context.

Literature & Data sources

Scan the QR code for a detailed list of literature and data sources used in the study.

Acknowledgments

This study was conducted as part of my research in applied economics at Warwick University, and I want to express my sincere gratitude to my supervisor, Robin Naylor, for his invaluable guidance, support, and expertise throughout the research process. I would also like to thank my closest friends & family for always being ready to FaceTime and discuss any of my doubts.

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