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1. Abstract

While a growing literature documents the short-term effects of public programs providing children with nutritious food, there is scarce evidence of the long-term effects of such programs. This paper studies the long-term consequences of access to nutritious food using the rollout of a free school breakfast program in Norwegian cities. This program provided children with nutritious food and replaced a hot school meal at the end of the day with similar caloric value but less micronutrients. Our results indicate that access to a nutritious school breakfast increases education by 0.1 years and earnings by 2-4 percent.

2. Introduction

Question:

- What are the long-term effects of a nutritious and free school breakfast?

Challenge:

- Socio-economic gradient in access to nutritious food.

What we do:

- We exploit the staggered implementation of a free school breakfast in Norwegian cities from 1921 to 1938 and study the impact on long-term outcomes.

Previous Literature:

- Previous research focus on short-term effects; long-term effects of school breakfast programs have not yet been studied.
 - Short and long-term outcomes may be different (Chetty et al., 2011).

4. The Oslo Breakfast

- Many Norwegian cities served a hot meal at school since the 1890s.
 - Served at the end of the day.
 - Criticized for lack of nutrition.
- Discovery of vitamins in the early 1920s:
 - Largely present in unprocessed fruit and vegetables.
- The Oslo breakfast was a free breakfast program that was introduced in Norway before WWII.
 - Content: Whole grain bread, butter, cold meat/cheese, milk, cod liver oil and unprocessed fruit and vegetables.
 - Ensured that children would eat a nutritious food prior to school and be better prepared to learn.
- Further goal: changing eating habits by teaching children to eat according to latest nutritional knowledge.

5. Implementation

- Decision to implement was made by municipalities.
- In total 26 out of 61 urban municipalities introduced the Oslo breakfast → covering half of the children living in cities.
- Rural municipalities had a different school system and used different breakfast programs.
 - Not included in this analysis.
- Program was stopped due to food rationing during World war II.
- Average cost 0.31 NOK in 1937 (1.10 USD today).
 - Less expensive than the school dinner it replaced

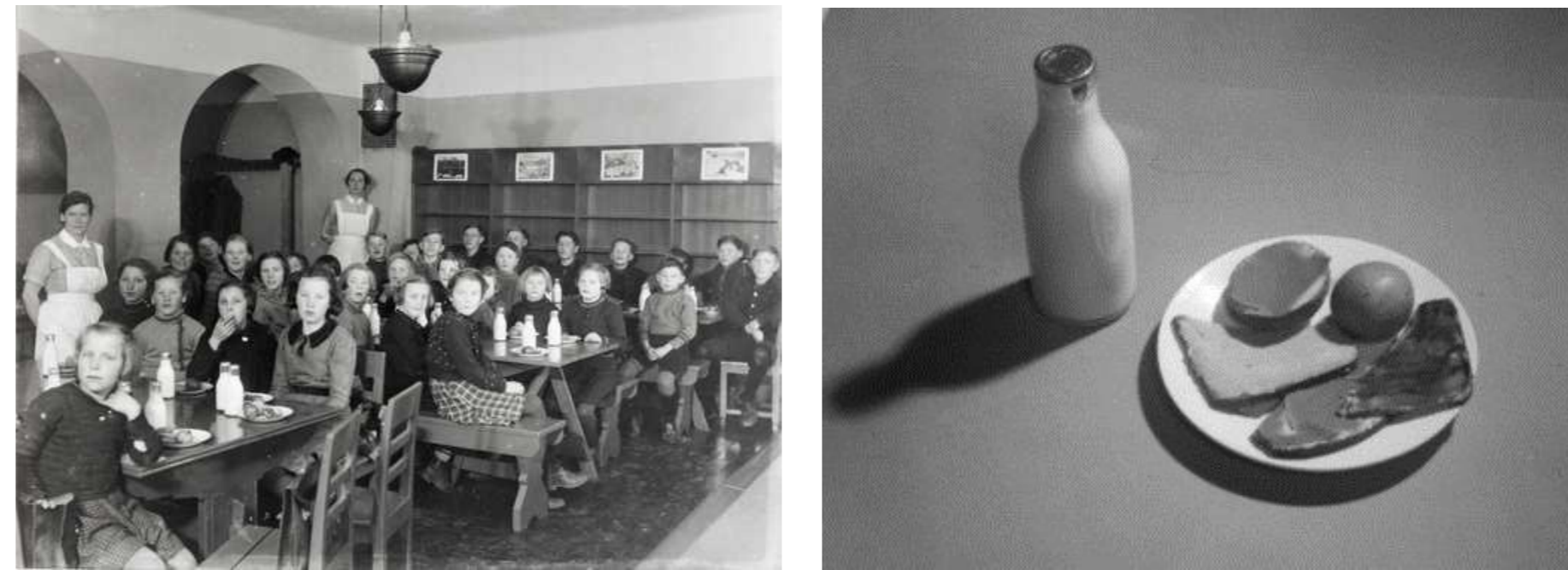


Table 1: The Rollout of the Oslo Breakfast

year		Municipalities
1921	1	Skien
1929	1	Halden
1930	4	Sarpsborg, Oslo, Tønsberg and Trondheim
1931	2	Bergen and Harstad
1932	2	Sandefjord and Haugesund
1933	2	Stavanger and Kristiansand
1934	2	Kopervik and Bodø
1935	3	Hamar, Arendal and Kristiansund
1936	4	Fredrikstad, Horten, Porsgrunn and Vardø
1937	4	Drammen, Larvik, Ålesund and Tromsø
1938	1	Mo
Obs.	26	

6. Estimation Strategy

We exploit the staggered introduction of the Oslo breakfast in different urban municipalities throughout Norway:

$$y_{icm} = \alpha_0 + \gamma D_{cm} + X_{icm} + \delta_c + \theta_m + \epsilon_{icm}$$

Where:

- y_{icm} : outcome variable
- D_{cm} : dummy variable equal to 1 for all individuals enrolled in school when breakfast was served and 0 otherwise
- γ : treatment effect of living in a municipality where the Oslo breakfast was served
- X_{icm} : vector of individual-level demographic characteristics
- δ_c : cohort dummies
- θ_m : municipality fixed effects

7. Data

- Sample: Individuals born from 1910-1932 in cities.
- Norwegian registry data and Census data from Statistics Norway:
 - Demographic variables
 - Socioeconomic variables
 - Municipality level data (Student teacher ratio, number of doctors per inhabitant, school attendance)
 - School breakfast (implementation date and uptake rate)

8. Results

Table 2: Long-term Outcomes

	Years of education	High school	Earnings age 56-61	Earnings 1967-1980
School Breakfast	0.095** (0.036)	0.017** (0.005)	3259.62* (1705.89)	2782.66*** (970.75)
Observations	157419	157419	142427	142427

Table 3: Long-Term Effects on Men's Occupational Status in 1960

	Self-employed	Skilled and semi-skilled	Low-skilled
School Breakfast	0.019** (0.007)	0.014* (0.007)	-0.029* (0.009)
Obs.	68515	68515	68515

Control variables: gender, inhabitants per doctor and student-teacher-ratio in the municipality of birth in the year of school start. Standard errors clustered at the municipality level.

Age at Treatment and Duration of Treatment

- As breakfast provision is stopped in 1940, we can distinguish between age at treatment and treatment duration.

Figure 1: Years of Treatment: Earnings

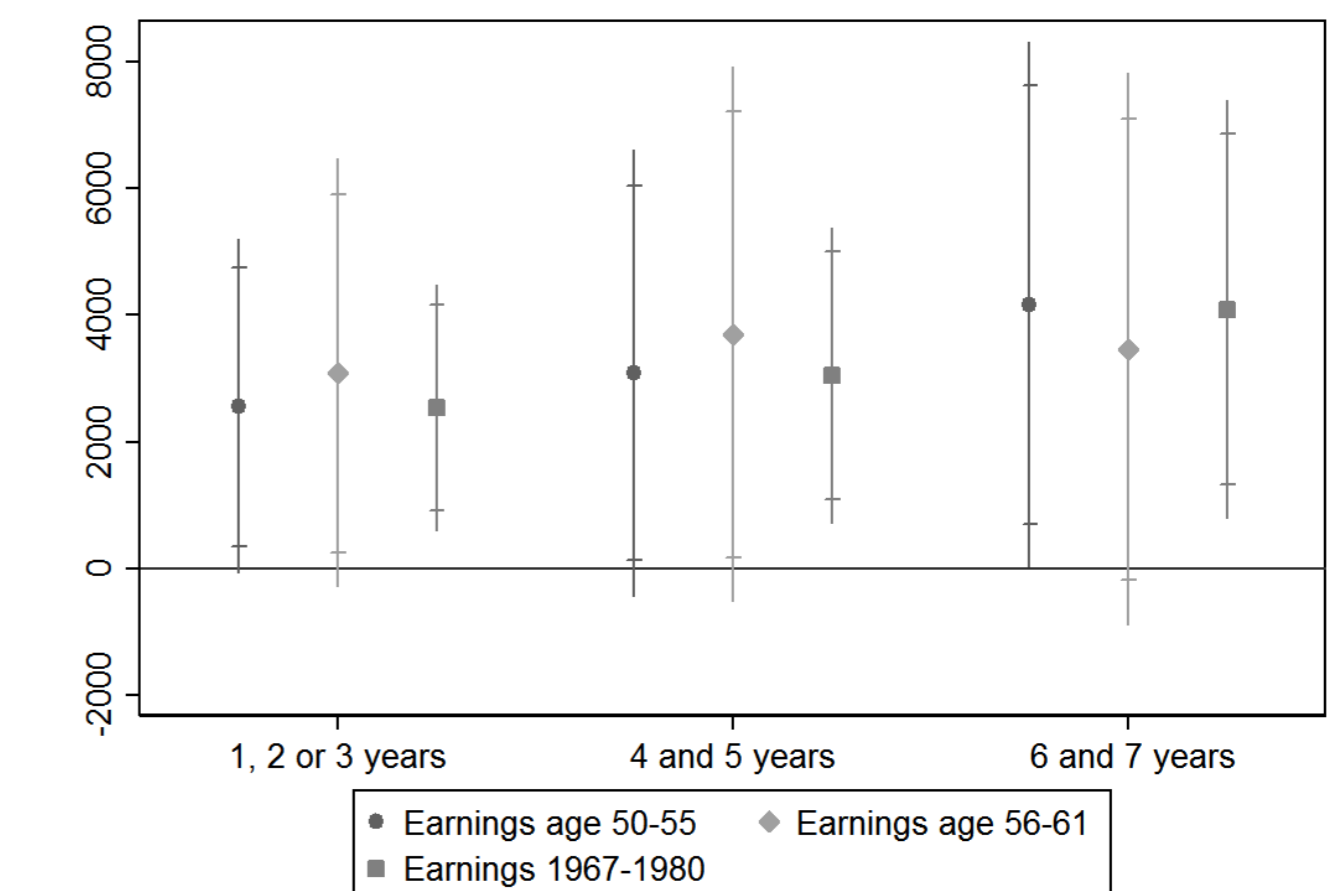


Figure 2: Years of Treatment: Years of Education

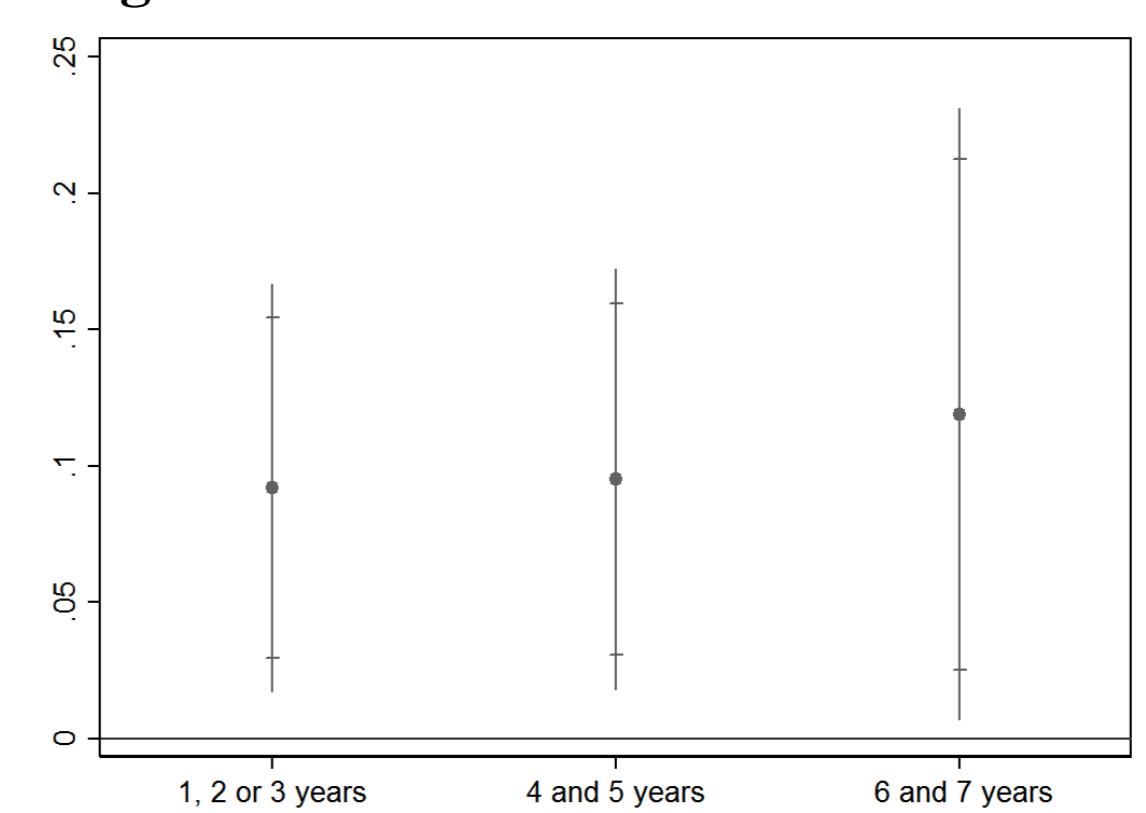


Figure 3: Age at Treatment: Earnings

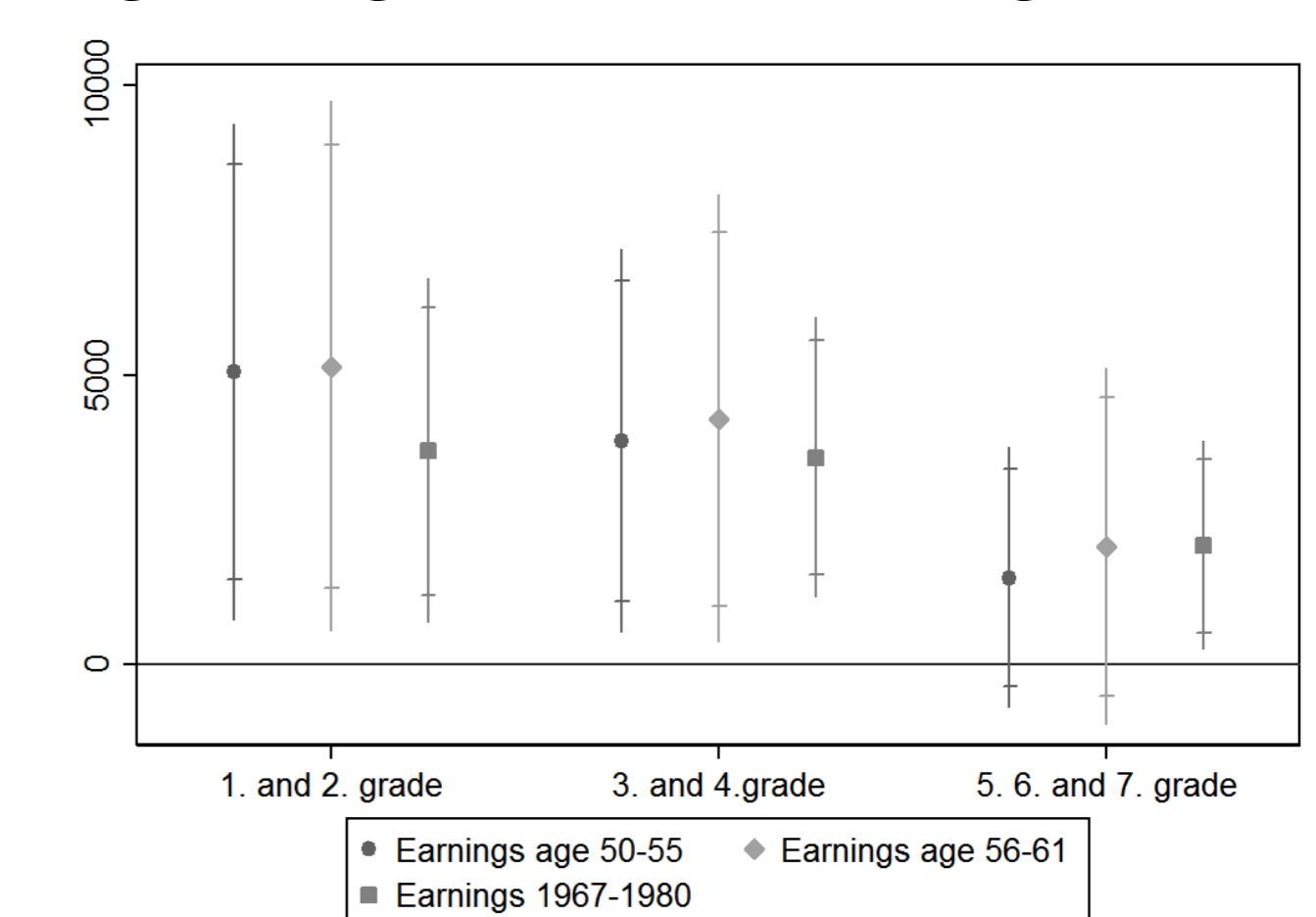
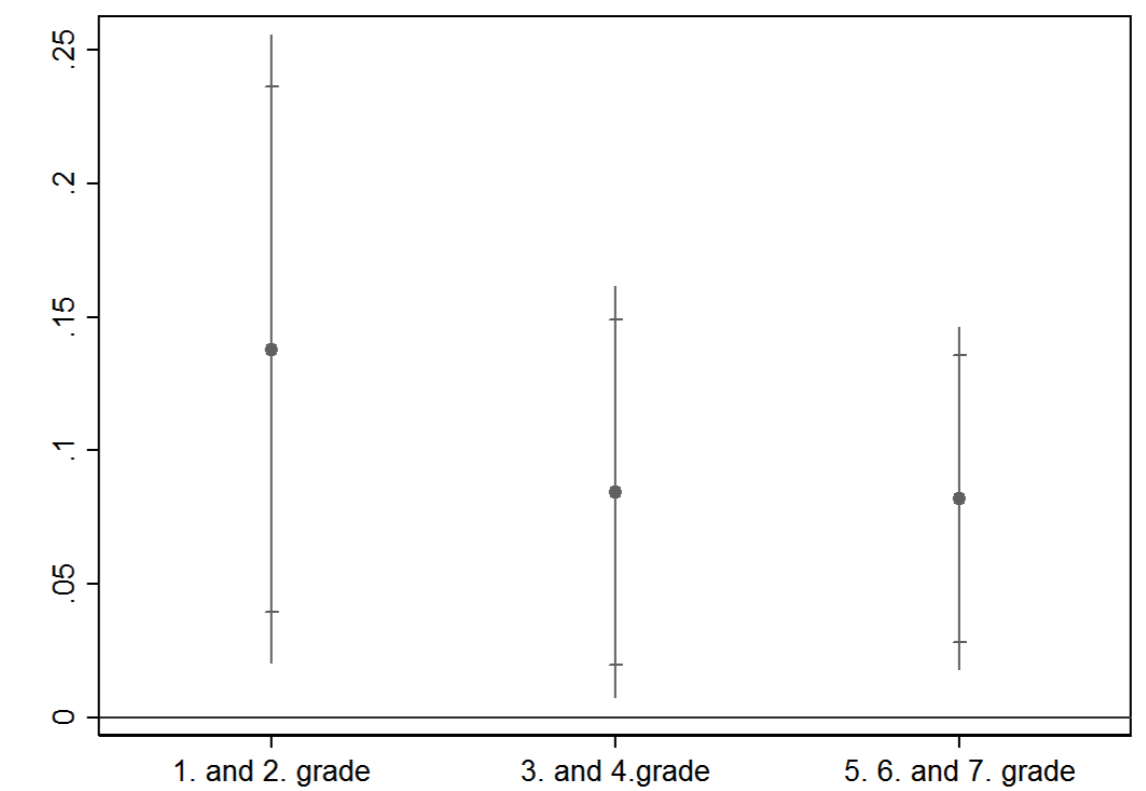


Figure 4: Age at Treatment: Years of Education



9. Interpretations

- Availability of school breakfast increases:
 - Completed years of education by 0.1 years (1%).
 - Likelihood of completing high school by 2 percentage points.
 - Average earnings by 2-4 percent.
- Effects are stronger for men, but not significantly different.
- The effects for breakfast exposure at an early age are not significantly different from the effects of exposure at later age.
- The effect for a longer breakfast exposure are not significantly different from the shorter exposure.

10. Robustness

- Include linear, quadratic, cubic municipality-specific time trend.
- Check whether sharp changes in potential confounding factors coincide with the introduction of the school breakfast:
 - Share of female representatives in city parliament
 - Importance of left wing parties
 - School expenditures per child

11. Summary

- We find that availability of free nutritious school breakfast can have long lasting effects
- Significantly positive effects on long-term economic outcomes such as years of education and life-time earnings
- Changed breakfast eating habits