How to Save the World as an Economist

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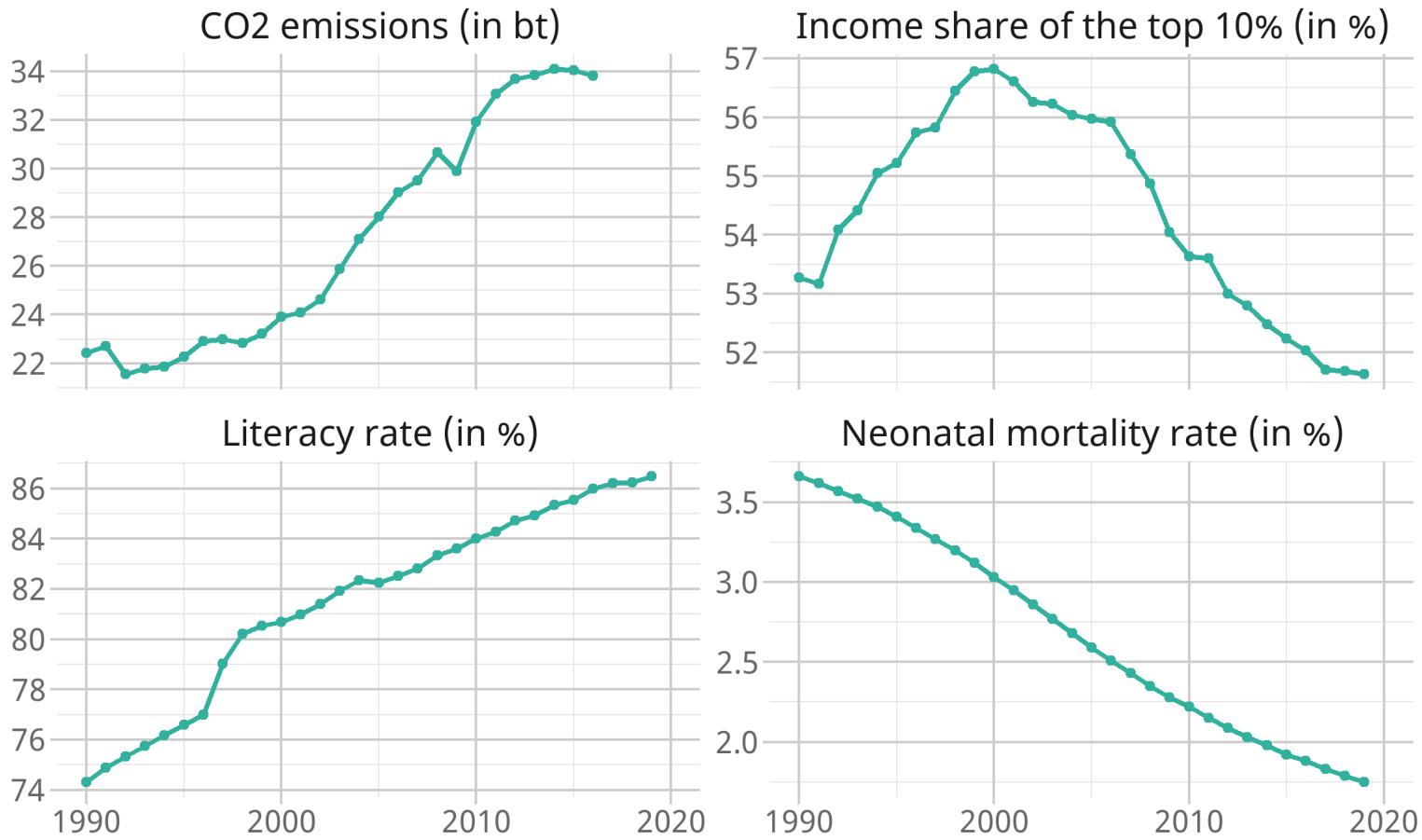
The World in Data



Data sources: The World Bank & The World Inequality Database. The charts are created using R. You can try this yourself here.

What is Economics?

> "a study of mankind in the ordinary business of life"
>
> *Alfred Marshall*

Questions about the 'ordinary business of life' that affects climate, inequality, education, health:

1. Does a fuel tax make people shift to transport modes with lower CO2 emissions?
2. How do school funding systems affect inequality in education?
3. Who benefits from a health intervention to reduce mortality among newborns?

School funding & inequality

The role of economics (or: what you learn in Economics @ Bristol)

1 Theoretical analysis

- Funding -> Incentives -> Behaviors -> Outcomes.
- Tools to formally analyze how school funding affect the behavior by school managers and teachers.

2 Empirical analysis

- Collect data about schools and funding systems.
- Statistical tools to analyze data to test theory and learn about behavioral responses to funding reforms.

School funding reform in Denmark in 2007

Background

1. **Before reform:** funding mainly based on needs. If a school needed new chairs they would ask politicians for funding.
2. **After reform:** funding based on activity and output. More students enrolled and graduated -> more funding.

Theoretical analysis

How do we expect high school managers to react?

- Incentive to do well and attract many students (gives more funding).
- Incentive to attract "easy students" (lower costs & more likely to graduate).

Conclusion: Reform might lead to better schools, but also to increased *segregation* (all easy students at the popular high school) -> increased inequality.

School funding reform in Denmark in 2007

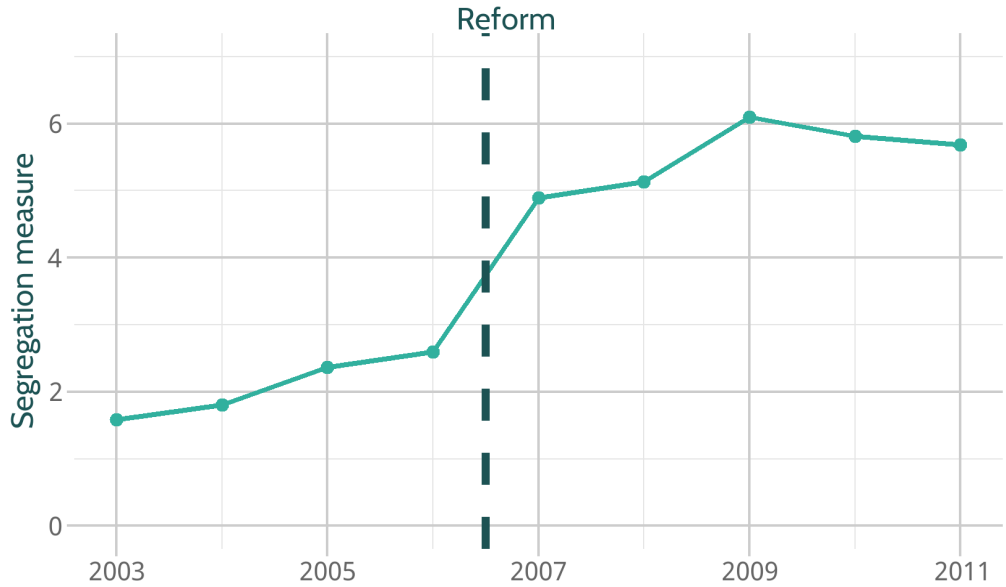
Empirical analysis: student segregation before and after reform

- Data on segregation in student enrollment.

Segregation

- *Before* reform: 2.09
- *After* reform: 5.52
- Change:

But many things change over time.

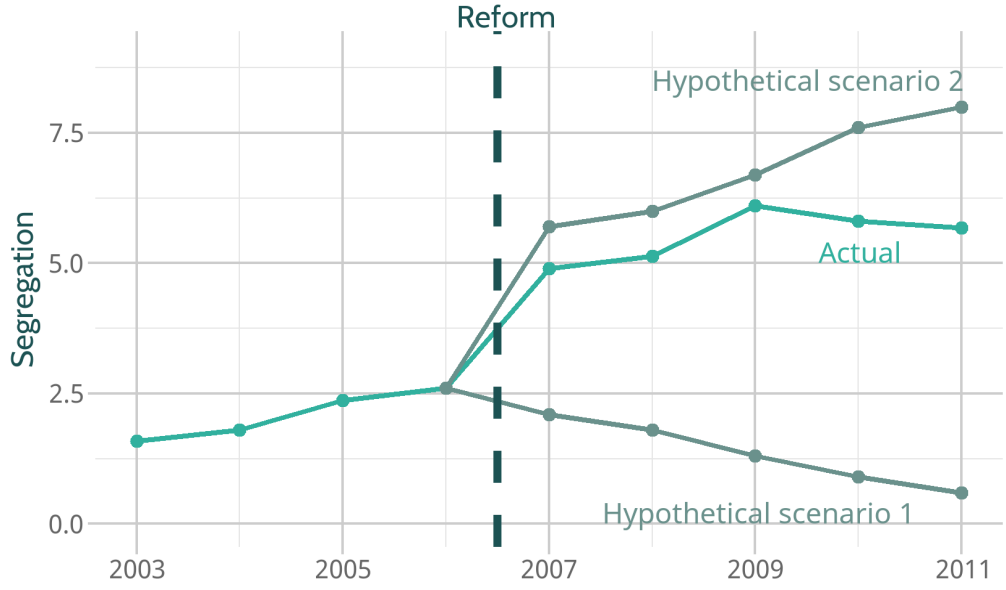


School funding reform in Denmark in 2007

Empirical analysis: what would have happened in absence of a reform?

- We don't know how the development would have been in absence of a reform.
- Many factors change over time: business cycles, other policies, etc.

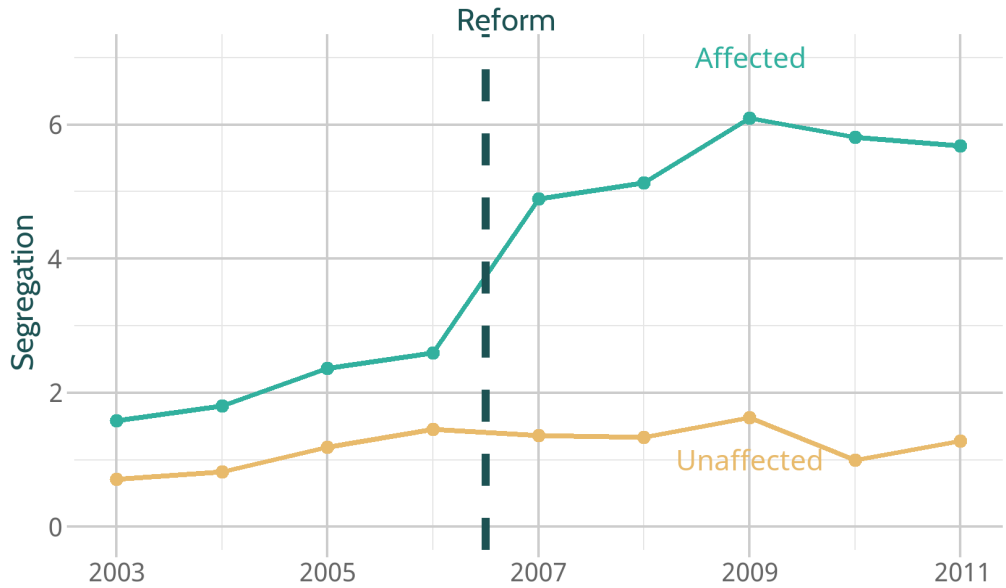
What is the best guess of how the trend in segregation would have developed in absence of reform?



School funding reform in Denmark in 2007

Empirical analysis: use unaffected schools to "guess trend"

- Another group of schools were not affected by the reform.
- Unaffected schools also affected by business cycles, other policies, etc.
- **Solution:** Use unaffected schools to get trend in absence of reform.



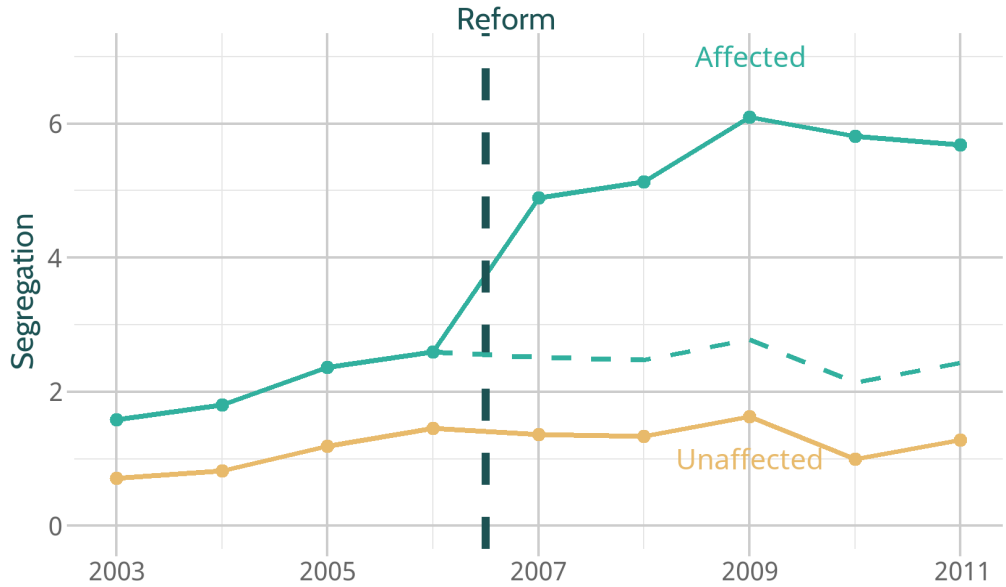
The charts are created using R. You can try this yourself here.

School funding reform in Denmark in 2007

Empirical analysis: Difference-in-Differences

- **Affected**
  - Before: 2.09
  - After: 5.52
  - Difference A:
- **Unaffected**
  - Before: 1.04
  - After: 1.32
  - Difference U:

Difference A- Difference U=



School funding reform in Denmark in 2007

- The data analysis approach is called "Difference-in-Differences.
- We use regression techniques and statistical software to analyze large datasets. We estimate:

$$y_i = \beta_1 + \beta_2 Affected_i + \beta_3 After_i + \beta_4 After_i \times Affected_i + e_i$$

Code

```
# Load & clean data
analysisdata<-read_csv("schooldata.csv")%>%
  filter(scenario=="Actual")%>%
              mutate(segregation=segregation*100,
                     type=ifelse(type=="Control",
                                 "Unaffected","Affected"),
                     After=ifelse(year>2006,1,0),
                     Affected=ifelse(type=="Affected",1,0),
                     AfterXAffected=After*Affected)
# Estimation
summary(lm(segregation~Affected+After+AfterXAffected,
           data=analysisdata))
```

Output

```
##
## Call:
## lm(formula = segregation ~ Affected + After + AfterXAffected,
##     data = analysisdata)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6304 -0.3167  0.0277  0.2848  0.5776
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.0430     0.1993   5.234 0.000126 ***
## Affected         1.0465     0.2818   3.714 0.002314 **
## After            0.2788     0.2673   1.043 0.314668
## AfterXAffected   3.1551     0.3781   8.345 8.34e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3985 on 14 degrees of freedom
## Multiple R-squared:  0.9652,    Adjusted R-squared:  0.9577
## F-statistic: 129.4 on 3 and 14 DF,  p-value: 1.918e-10
```

This is an example R code. You can try this yourself here.

School funding & inequality

Analysing a Danish school funding reform

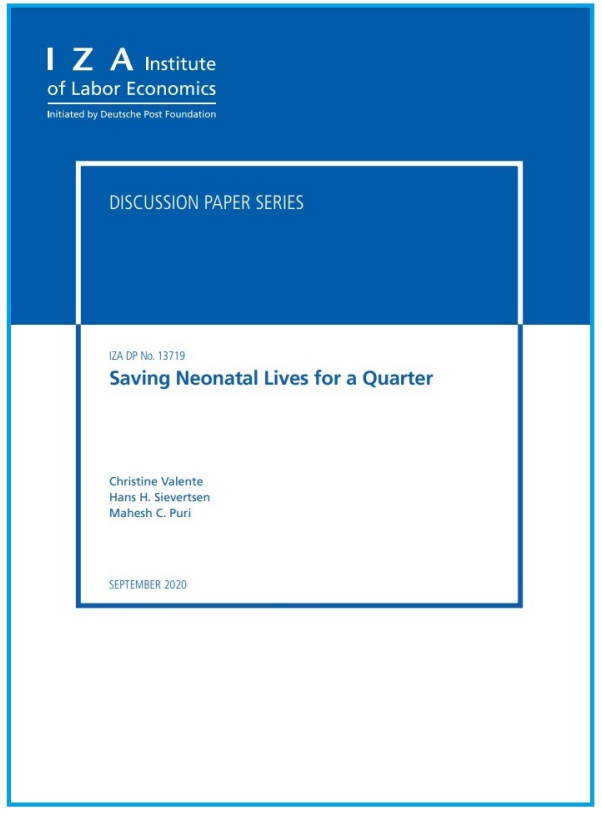
Summary

- We formalized theoretical predictions.
- We collected and analyzed the data: The reform increased segregation by 3.16 units (151%).
- Inform policy makers about consequences
- Assist policy makers in designing new policies to mitigate unattended effects of finance reform.

Who benefits from a health intervention to newborns?

- **Over 400,00 children die annually from blood infections.**

- A disinfectant called CHX could be a game changer at low costs.
  - 3 experiments show that CHX worked well.
  - 2 experiments did not confirm that it worked well.
  - => Policy not introduced in many countries.
- **Question:** Why did CHX work in some experiments and not in others?
- We evaluate the effectiveness of CHX in Nepal and investigate whether it is more effective for some children than for other children.



Who benefits from a health intervention to newborns?

Empirical analysis

- **2008** No district used CHX
- **2009** Four districts used CHX
- **Method:** Compare change mortality from 2008 to 2009 in treated districts to change in mortality in unaffected districts -> **Difference-in-differences!**

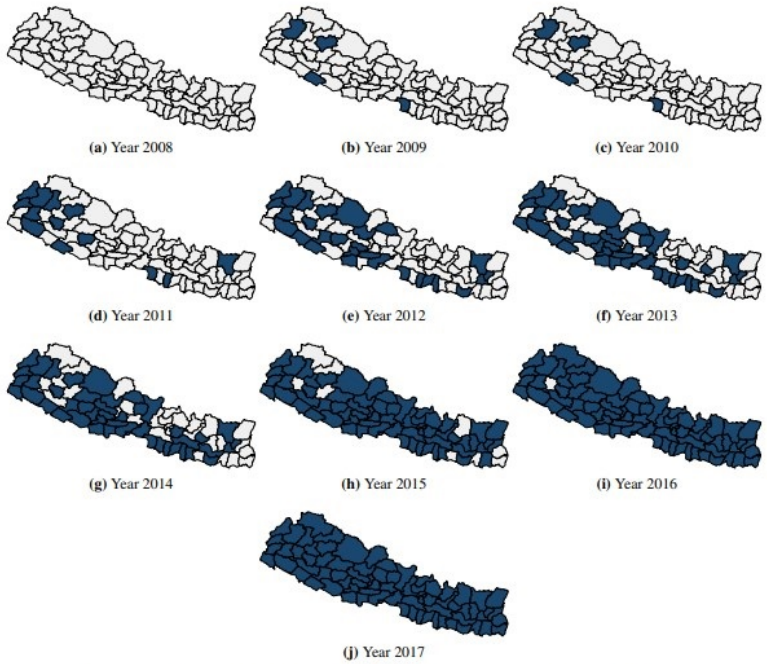


Figure 1: CHX cord application roll-out across districts over time (adopted CHX=blue).

Who benefits from a health intervention to newborns?

- **Challenge:** many districts & many differences.
- **Solution:** use statistical software and estimate the following equation:

$$m_{idt} = \alpha + \beta CHX_{dt} + D'_d\Delta + T'_t\Gamma + X'_{idt}\Lambda + \epsilon_{idt}$$

Results

Table 2: Regression results: The effect of CHX-NCP on neonatal mortality - Dependent variable: Mortality by ≤1m.

	Sample			
	All	All	P(home birth) <0.5	P(home birth) >0.5
	(1)	(2)	(3)	(4)
CHX	-0.018**	-0.007	0.001	-0.028**
	(0.007)	(0.007)	(0.009)	(0.011)
1[P(home birth)>0.5]		-0.001		
		(0.005)		
CHX × 1[P(home birth)>0.5]		-0.021***		
		(0.008)		
CHX + CHX × 1[P(home birth)>0.5]		-0.028***		
		(0.008)		
Observations	23,465	23,465	10,860	12,605
Clusters	73	73	73	73
Control mean of dep. var	0.042	0.042	0.033	0.050
P-val (dif across sample)				0.031

Conclusion: CHX much more effective among home births.

Summary

- Economics is **"a study of mankind in the ordinary business of life".**
- We use formal theory and data analysis to study questions on topics such as climate, health, education, inequality.
- The **economics toolbox is popular.** I've worked with medical doctors, sociologists, psychologists, political scientists, & nurses.
- In Bristol we teach these tools.