The heterogenous effects of a financial crisis on the demand for oral health services

Joint work with Maiken Aaskoven[1], Trine Kjær[2] and Dorte Gyrd-Hansen[3]

Part of the PRUDENT project (**P**rioritazation, incentives and **R**esource use for s**U**stainable **DENT**istry)

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[1] Assistant Professor, Danish Centre for Health Economics
[2] Professor, Danish Centre for Health Economics
[3] Professor and Director, Danish Centre for Health Economics

Oral health services in Denmark

Free dental care
- Children
- Disabled
- Hospital treatment

Subsidy system
- Adults
- Average of 80% co-payment

Higher subsidies for:
- Young people
- Preventive care

Equity in access
- Equal access through universal (public funded) healthcare system

Inequity in access
- Co-payment can create a barrier in access

Natural experiment

The Great Recession

Natural experiment

The Great Recession

The 2008 Great Recession was a global economic downturn that led to widespread financial instability, bank failures, and a severe recession

Key causes:
- Collapse of housing bubble
- High risk mortgages

Consequences:
- Global Recession
- Unemployment
- Sharp declines in stock prices

Resilience:
- Higher for the high income group
- Lower for the low income group

Recovery:
- Slow and uneven

Hypotheses

Lower income groups, with low financial resilience, are expected to exhibit greater responsiveness to financial shocks

Demand for fully subsidized health care services, such as general practice services, are expected to remain relatively unaffected by financial shocks

Data

Danish register data

Period of analysis: 2006-2012

Age from 26
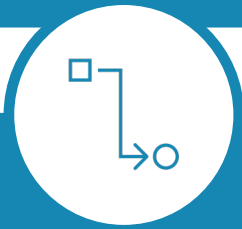
Alive and living in Denmark

No missing values for income

Population: 2,804,343 individuals

Design and method

Difference-in-Difference design

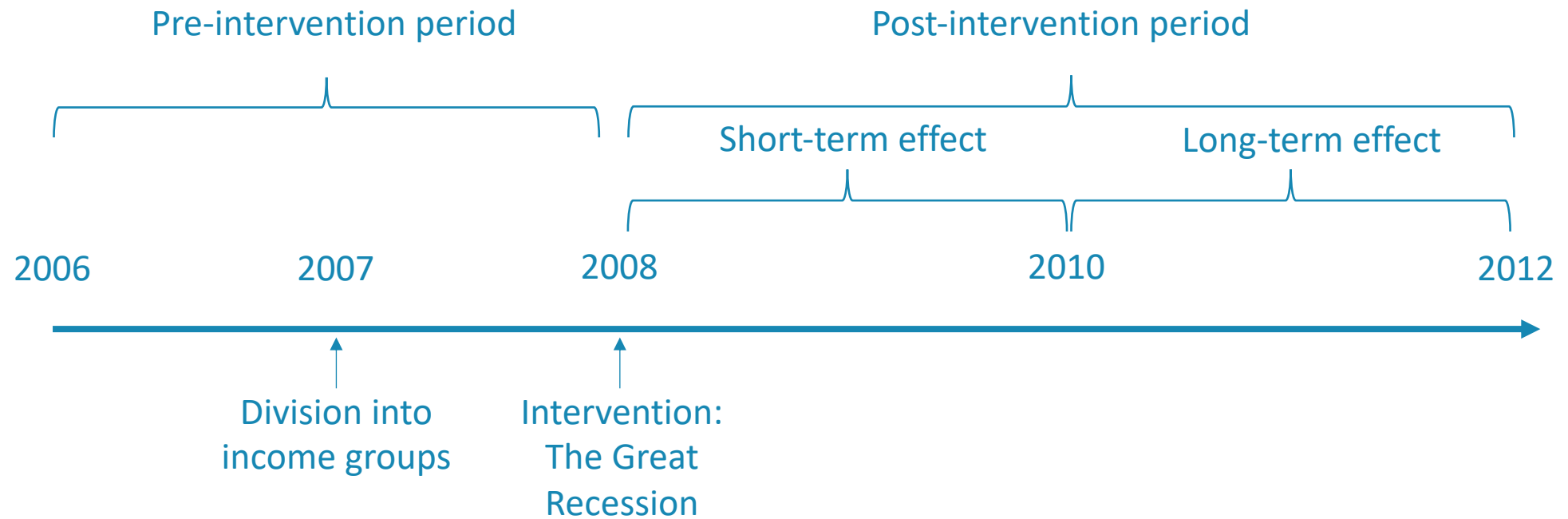Causal effects of the financial crisis

The Great Recession (2008) as intervention or treatment

Lower income ('treatment group') and higher income group ('control group')

Design and method

Model

$$Y_{it} = \gamma_0 + \gamma_1 income_{it} + \gamma_2 time_{it} + \gamma_3 income_{it} \cdot time_{it} + \gamma_4 \delta_{it} + \varepsilon_{it}$$

Y_{it}:   The utilization of dental health services or general practitioner services.

$income_{it}$:   Binary variable equal to one for low-income group.

$time_{it}$:   Binary variable equal to one for post-intervention period.

$income_{it} \cdot time_{it}$:   Interaction between income group and time periods.

δ_{it}:   Demographic controls; sex, age, living area, origin, living arrangements, education, socio-economic status, income and Elixhauser index.

Descriptive Statistics 2007

	Analysis sample (N=1402171)	High income group (N=701085)	Low income group (N=701086)
Dental services			
Mean(SD)	1.468 (± 1.884)	1.532 (± 1.801)	1.405 (± 1.962)
General practice services			
Mean(SD)	9.060 (± 11.25)	6.662 (± 8.132)	11.46 (± 13.25)
Sex			
Female	654853 (47 %)	245434 (35 %)	409419 (58 %)
Male	747318 (53 %)	455651 (65 %)	291667 (42 %)
Age			
Mean(SD)	48.61 (± 12.21)	47.61 (± 10.11)	49.62 (± 13.94)
Length of education			
Mean(SD)	13.67 (± 3.086)	15.05 (± 2.519)	12.25 (± 2.968)
Missing	24091 (1.7%)	4456 (0.6%)	19635 (2.8%)
Socioeconomic status			
Employee	773787 (55 %)	609603 (87 %)	164184 (23 %)
Self employed	124031 (9 %)	58356 (8 %)	65675 (9 %)
Retired	300179 (21 %)	25035 (4 %)	275144 (39 %)
Other	204174 (15 %)	8091 (1 %)	196083 (28 %)
Income in 1000kr			
Mean(SD)	226.3 (± 503.2)	358.1 (± 668.2)	94.59 (± 158.8)
Elixhauser index			
Mean(SD)	0.3544 (± 1.860)	0.3025 (± 1.572)	0.3998 (± 2.078)
Missing	409001 (29.2%)	238228 (34.0%)	170773 (24.4%)

Preliminary results
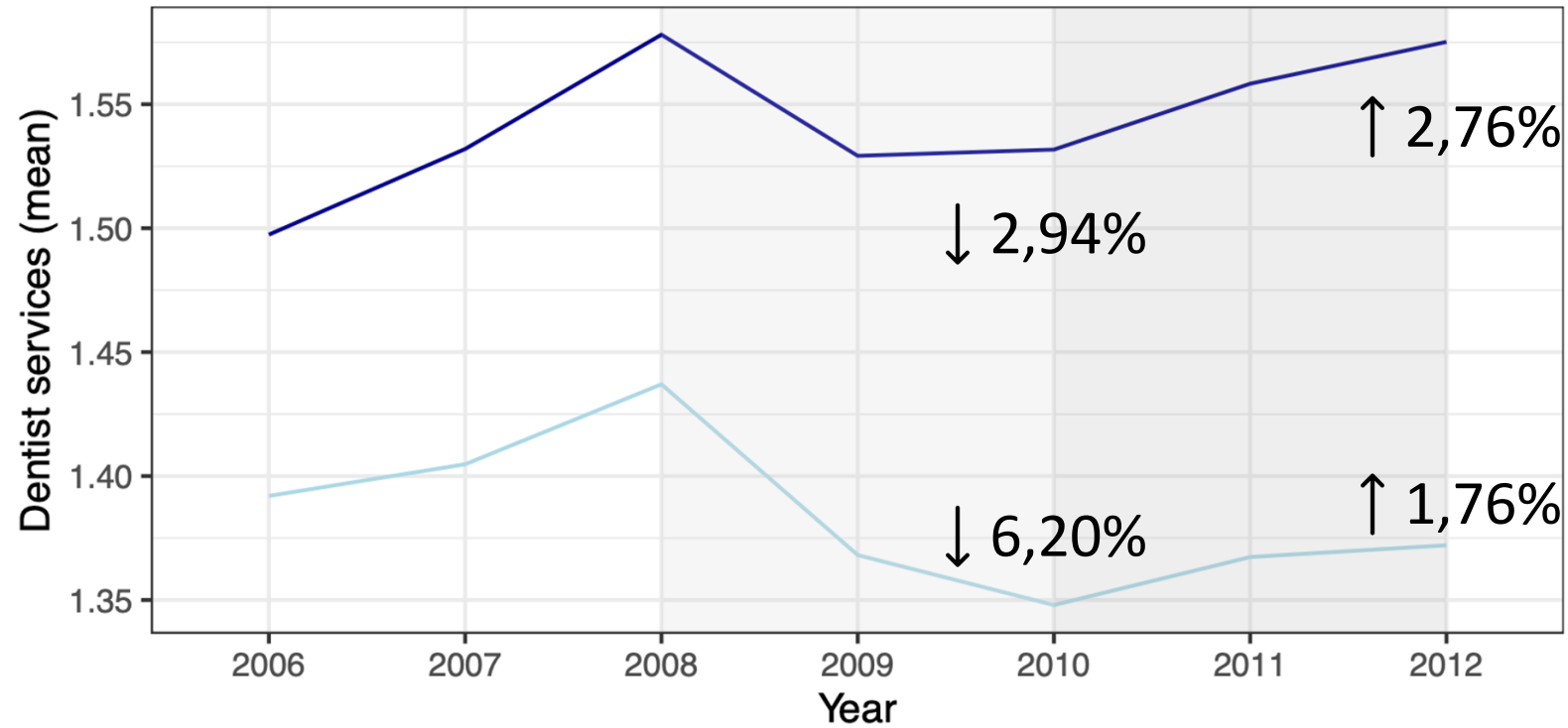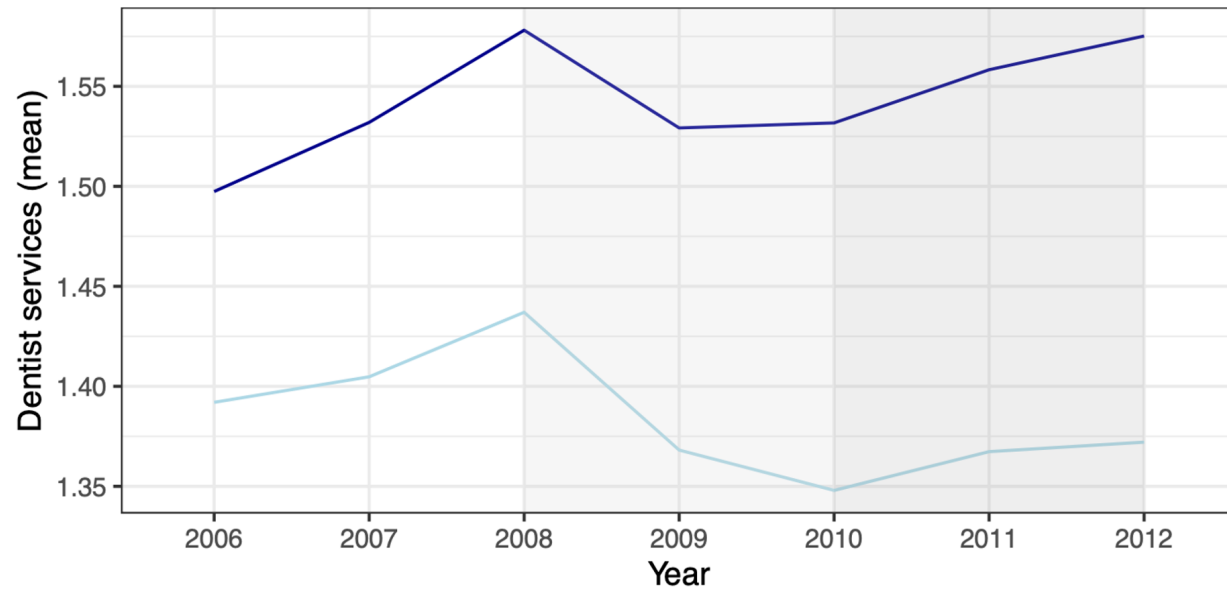

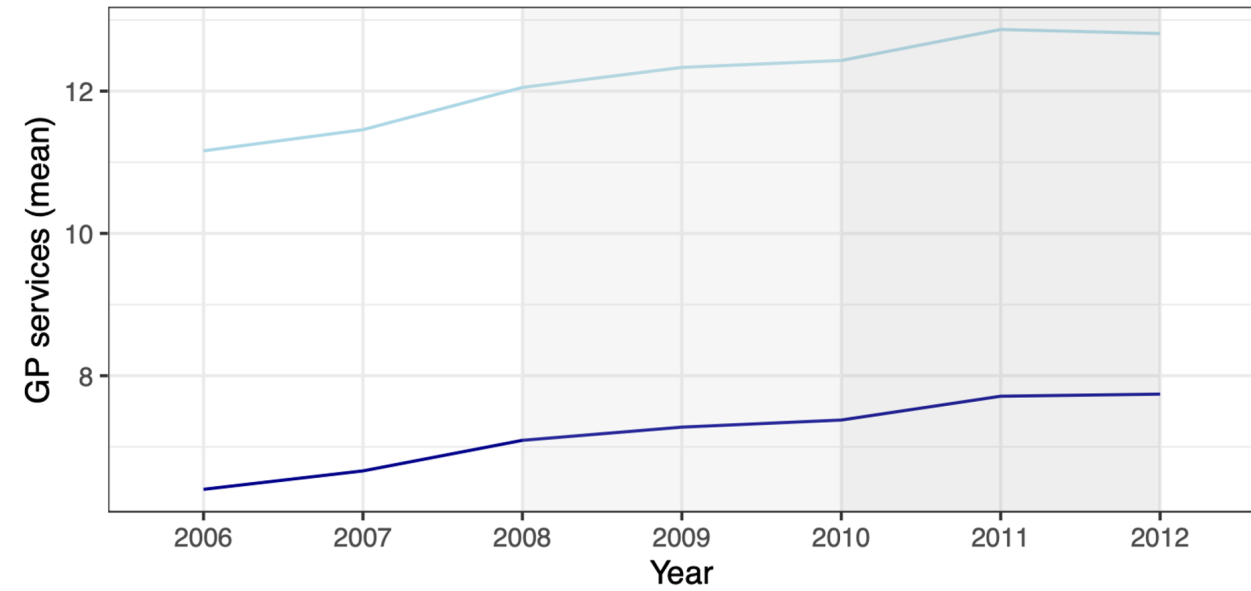Dentist services for lowest and highest income quartile

Preliminary results

Dentist services for lowest and highest income quartile

GP services for lowest and highest income quartile

Groups — High income group — Low income group

Dependent variable: Dentist services

	OLS (1)	panel linear (2)	OLS (3)	(4)	(5)	(6)	OLS (7)	(8)	(9)	(10)	(11)
Treatment	-0.116*** (0.002)		-0.144*** (0.002)	-0.204*** (0.002)	-0.194*** (0.002)	-0.154*** (0.002)	-0.147*** (0.002)	(0.002)	(0.003)	(0.005)	(0.005)
After	0.040*** (0.002)	0.040*** (0.001)	0.040*** (0.002)	-0.072*** (0.002)	-0.073*** (0.002)	-0.070*** (0.002)	-0.069*** (0.002)	-0.074*** (0.002)	-0.071*** (0.002)	-0.071*** (0.002)	-0.070*** (0.002)
Treatment:After	-0.060*** (0.003)	-0.060*** (0.002)	-0.060*** (0.003)	-0.060*** (0.003)	-0.060*** (0.003)	-0.060*** (0.003)	-0.059*** (0.003)	-0.061*** (0.003)	-0.071*** (0.003)	-0.071*** (0.003)	-0.073*** (0.003)
Male			-0.118*** (0.001)	-0.100*** (0.001)	-0.098*** (0.001)	-0.093*** (0.001)	-0.093*** (0.001)	-0.091*** (0.001)	-0.096*** (0.001)	-0.096*** (0.001)	-0.083*** (0.001)
Age				0.032*** (0.00005)	0.032*** (0.00005)	0.031*** (0.00005)	0.031*** (0.00005)	0.032*** (0.0001)	0.031*** (0.0001)	0.031*** (0.0001)	0.031*** (0.0001)
Area: intermediate					0.024*** (0.002)	0.006*** (0.002)	0.001 (0.002)	0.010*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.005** (0.002)
Area: remote					-0.128*** (0.002)	-0.157*** (0.002)	-0.162*** (0.002)	-0.149*** (0.002)	-0.156*** (0.002)	-0.156*** (0.002)	-0.175*** (0.003)
Area: rural					-0.055*** (0.001)	-0.080*** (0.001)	-0.086*** (0.001)	-0.075*** (0.001)	-0.080*** (0.001)	-0.080*** (0.001)	-0.092*** (0.002)
Origin: non-danish						-0.326*** (0.002)	-0.328*** (0.002)	-0.304*** (0.002)	-0.292*** (0.002)	-0.292*** (0.002)	-0.296*** (0.003)
Living alone							-0.064*** (0.001)	-0.054*** (0.001)	-0.048*** (0.001)	-0.048*** (0.001)	-0.039*** (0.002)
Education								0.014*** (0.0002)	0.013*** (0.0002)	0.013*** (0.0002)	0.016*** (0.0003)
Socio status: other									-0.094*** (0.002)	-0.094*** (0.002)	-0.080*** (0.003)
Socio status: retired									0.014*** (0.002)	0.014*** (0.002)	0.018*** (0.002)
Socio status: self employed									0.081*** (0.002)	0.082*** (0.002)	0.085*** (0.003)
Income										-0.00000** (0.00000)	-0.00000 (0.00000)
Elixhauser											0.002*** (0.0004)
Constant	1.515*** (0.002)		1.592*** (0.002)	0.075*** (0.003)	0.076*** (0.003)	0.133*** (0.003)	0.156*** (0.003)	-0.095*** (0.005)	-0.058*** (0.005)	-0.058*** (0.005)	-0.061*** (0.006)
Observations	9,815,197	9,815,197	9,815,197	9,815,197	9,815,195	9,815,195	9,815,195	9,648,420	9,648,420	9,648,420	7,127,285
R^2	0.002	0.0001	0.003	0.045	0.045	0.047	0.048	0.048	0.048	0.048	0.046
Adjusted R^2	0.002	-0.167	0.003	0.045	0.045	0.047	0.048	0.048	0.048	0.048	0.046
Residual Std. Error	1.906 (df=9815193)		1.906 (df=9815192)	1.865 (df=9815191)	1.865 (df=9815186)	1.862 (df=9815185)	1.862 (df=9815184)	1.861 (df=9648408)	1.860 (df=9648405)	1.860 (df=9648404)	1.892 (df=7127268)
F Statistic	5,866.825*** (df=3; 9815193)	504.021*** (df=2; 8413024)	6,628.067*** (df=4; 9815192)	91,599.720*** (df=5; 9815191)	57,895.010*** (df=8; 9815186)	54,216.820*** (df=9; 9815185)	49,017.040*** (df=10; 9815184)	43,761.540*** (df=11; 9648408)	34,678.070*** (df=14; 9648405)	32,366.590*** (df=15; 9648404)	21,604.540*** (df=16; 7127268)

Note: *p<0.1; **p<0.05; ***p<0.01

Dependent variable: GP services

	OLS (1)	panel linear (2)	(3)	(4)	OLS (5)	(6)	(7)	(8)	(9)	(10)	(11)
Treatment	(0.014)		(0.014)	(0.013)	3.514*** (0.014)	3.423*** (0.014)	3.412*** (0.014)	2.698*** (0.014)	0.910*** (0.015)	0.928*** (0.015)	1.386*** (0.019)
After	0.907*** (0.011)	0.907*** (0.007)	0.907*** (0.011)	0.434*** (0.011)	0.446*** (0.011)	0.439*** (0.011)	0.438*** (0.011)	0.487*** (0.011)	0.462*** (0.011)	0.460*** (0.011)	0.396*** (0.015)
Treatment:After	0.281*** (0.016)	0.281*** (0.010)	0.281*** (0.016)	0.281*** (0.016)	0.279*** (0.016)	0.279*** (0.016)	0.278*** (0.016)	0.302*** (0.016)	0.398*** (0.016)	0.397*** (0.016)	0.157*** (0.020)
Male			-3.762*** (0.007)	-3.683*** (0.007)	-3.711*** (0.007)	-3.721*** (0.007)	-3.722*** (0.007)	-3.718*** (0.007)	-3.576*** (0.007)	-3.578*** (0.007)	-3.111*** (0.009)
Age				0.135*** (0.0003)	0.131*** (0.0003)	0.133*** (0.0003)	0.133*** (0.0003)	0.120*** (0.0003)	0.043*** (0.0004)	0.042*** (0.0004)	0.021*** (0.0005)
Area: intermediate					0.766*** (0.010)	0.808*** (0.010)	0.815*** (0.010)	0.601*** (0.011)	0.668*** (0.010)	0.670*** (0.010)	0.642*** (0.013)
Area: remote					1.081*** (0.013)	1.147*** (0.013)	1.155*** (0.014)	0.856*** (0.014)	0.997*** (0.014)	0.999*** (0.014)	1.109*** (0.017)
Area: rural					0.992*** (0.009)	1.050*** (0.009)	1.057*** (0.009)	0.824*** (0.009)	0.895*** (0.009)	0.897*** (0.009)	0.893*** (0.011)
Origin: non-danish						0.757*** (0.013)	0.760*** (0.013)	0.697*** (0.013)	0.563*** (0.013)	0.564*** (0.013)	0.761*** (0.016)
Living alone							0.092*** (0.008)	0.024*** (0.008)	-0.264*** (0.008)	-0.264*** (0.008)	0.033*** (0.011)
Education								-0.286*** (0.001)	-0.215*** (0.001)	-0.216*** (0.001)	-0.241*** (0.002)
Socio status: other									2.297*** (0.013)	2.303*** (0.013)	2.591*** (0.016)
Socio status: retired									4.734*** (0.012)	4.739*** (0.012)	4.583*** (0.015)
Socio status: self employed									-0.745*** (0.014)	-0.749*** (0.014)	-0.754*** (0.018)
Income										0.0001*** (0.00001)	0.0001*** (0.00001)
Elixhauser											0.695*** (0.002)
Constant	6.532*** (0.010)		8.977*** (0.011)	2.561*** (0.017)	2.387*** (0.018)	2.255*** (0.018)	2.222*** (0.018)	7.264*** (0.029)	9.631*** (0.030)	9.610*** (0.030)	11.637*** (0.038)
Observations	9,815,197	9,815,197	9,815,197	9,815,197	9,815,195	9,815,195	9,815,195	9,648,420	9,648,420	9,648,420	7,127,285
R^2	0.047	0.005	0.071	0.091	0.092	0.093	0.093	0.097	0.113	0.113	0.109
Adjusted R^2	0.047	-0.161	0.071	0.091	0.092	0.093	0.093	0.097	0.113	0.113	0.109
Residual Std. Error	11.457 (df=9815193)		11.311 (df=9815192)	11.189 (df=9815191)	11.179 (df=9815186)	11.177 (df=9815185)	11.177 (df=9815184)	11.119 (df=9648408)	11.020 (df=9648405)	11.020 (df=9648404)	11.880 (df=7127268)
F Statistic	160,057.300*** (df=3; 9815193)	20,590.650*** (df=2; 8413024)	187,017.800*** (df=4; 9815192)	195,709.800*** (df=5; 9815191)	124,685.000*** (df=8; 9815186)	111,264.800*** (df=9; 9815185)	100,151.900*** (df=10; 9815184)	94,521.490*** (df=11; 9648408)	88,121.260*** (df=14; 9648405)	82,259.530*** (df=15; 9648404)	54,300.670*** (df=16; 7127268)

Note: *p<0.1; **p<0.05; ***p<0.01

Preliminary results

Oral health services

	OLS	panel linear									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Treatment	-0.116***		-0.144***	-0.204***	-0.194***	-0.154***	-0.147***	-0.108***	-0.090***	-0.091***	-0.082***
	(0.002)		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
After	0.040***	0.040***	0.040***	-0.072***	-0.073***	-0.070***	-0.069***	-0.074***	-0.071***	-0.071***	-0.070***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Treatment:After	-0.060***	-0.060***	-0.060***	-0.060***	-0.060***	-0.060***	-0.059***	-0.061***	-0.071***	-0.071***	-0.073***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)

Dependent variable: Dentist services — OLS

+ With individual fixed effect
+ Sex (female)
+ Age
+ Area (urban)
+ Origin (Danish)
+ Living condition (not living alone)
+ Education
+ Socioeconomic status (employee)
+ Income
+ Elixhauser index

Preliminary results

General practice services

	OLS	panel linear									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Treatment	4.776***		3.896***	3.643***	3.514***	3.423***	3.412***	2.698***	0.910***	0.928***	1.386***
	(0.014)		(0.014)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.019)
After	0.907***	0.907***	0.907***	0.434***	0.446***	0.439***	0.438***	0.487***	0.462***	0.460***	0.396***
	(0.011)	(0.007)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.015)
Treatment:After	0.281***	0.281***	0.281***	0.281***	0.279***	0.279***	0.278***	0.302***	0.398***	0.397***	0.157***
	(0.016)	(0.010)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.020)

Dependent variable: GP services

+ With individual fixed effect
+ Sex (female)
+ Age
+ Area (urban)
+ Origin (Danish)
+ Living condition (not living alone)
+ Education
+ Socioeconomic status (employee)
+ Income
+ Elixhauser index

Planned supplementary analyses

Cardiovascular disease (mechanical heart valve)

Number of visits to dentist

Preventive and non-preventive services

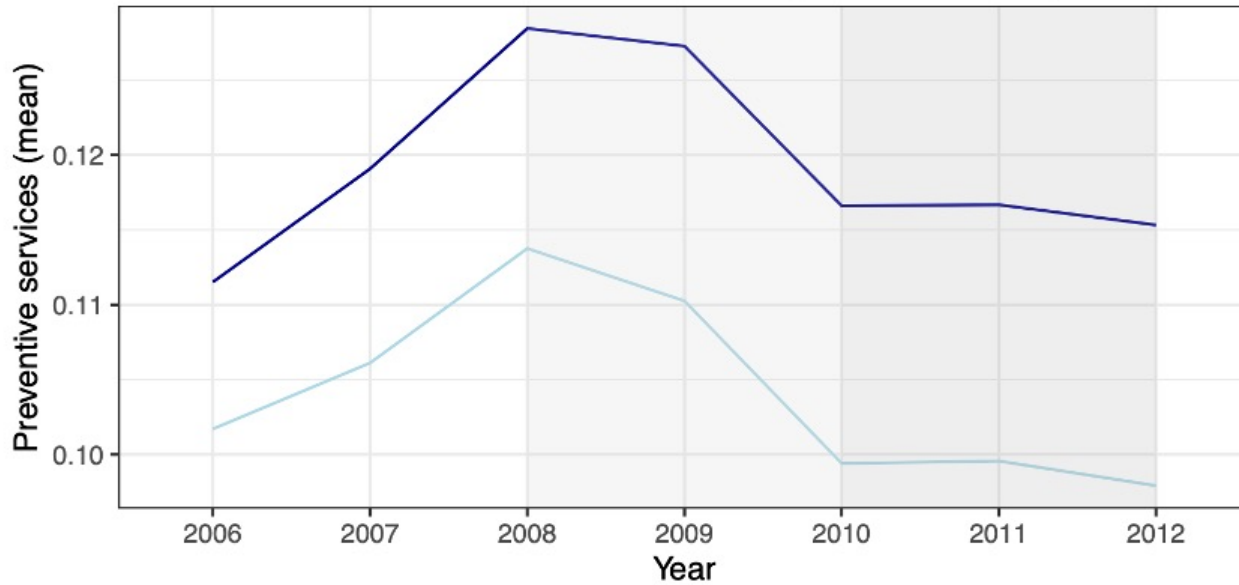Preventive visits at GP (screening for cervical cancer)

Heterogeneity analysis of high income group

SDU
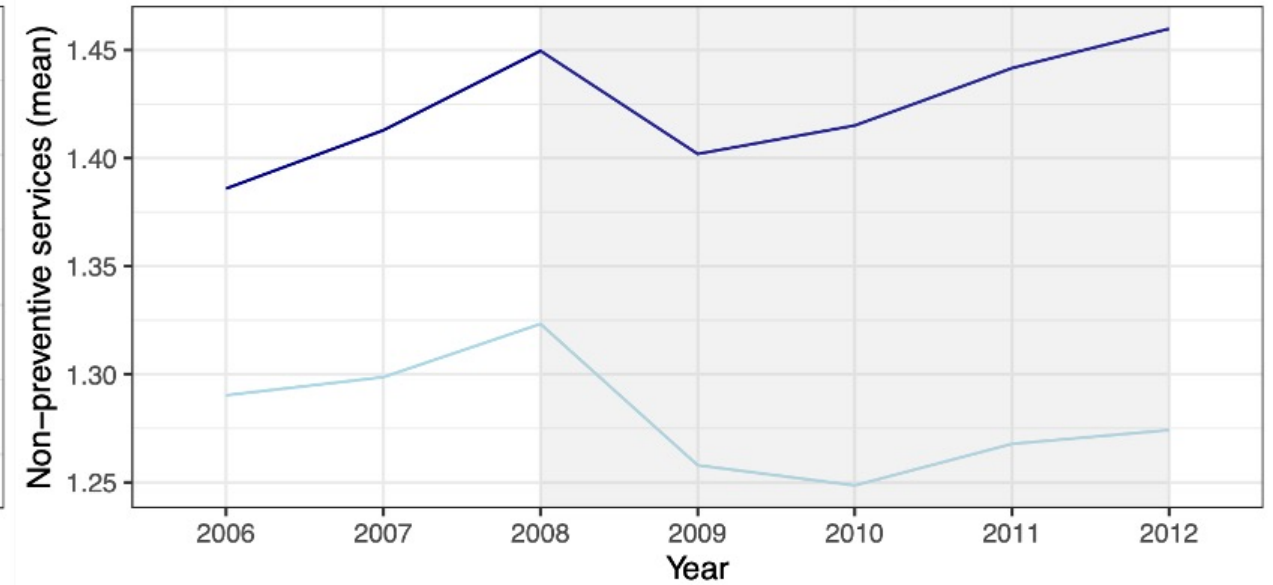
Danish Centre for Health Economics
- DaCHE

Supplementary analyses

Preventive services for lowest and highest income quartile

Non-preventive services for lowest and highest income quartile

Groups
— High income group
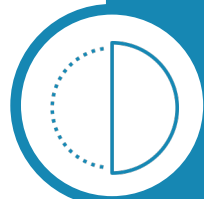— Low income group

Planned robustness checks

Conditioned by utilization in pre-intervention period

Previous time period

Division of groups (median and decile)

Family income

Education

Discussion and conclusion

Unmet need or overconsumption?

Solution: Differentiated payment?

Thank you for your attention!

Rie Fog – Nielsen

✉ rfog@health.sdu.dk

🖥 https://portal.findresearcher.sdu.dk/persons/rfog

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