National Minimum Wage and Teenagers' Education and Employment Choices

A differences-in-differences analysis

Outline

- Policy background

- Our original work

    – Methods & Descriptive charts

    – Results

    – Limitation and hence....

- Our recent attempts

    - Methods,

    - Results and discussion

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UK Policy Background

- National Minimum Wage introduced in 1999 for 18 year olds and above; at £3.00 for 18-21 year olds and £3.60/hour for 22+

- The youth rate was introduced in 2004 October for 16 and 17 year olds at £3.00 per hour, when the 18-21 rate was £4.10 and the adult rate was £4.85

- But the Education Maintenance Allowance was also rolled out nationally in September 2004, under which 16-18 year olds from low-income families could get cash for staying on after compulsory education

Motivation and strategy

- What's the impact of the youth rate on 16-17 year olds in terms of education and labour market choices:
  - 1) whether in Full-time education (FTE), 2) NEET, 3) in work if in FTE, and 4) in work if not in FTE

- A differences-in-differences analysis that exploited geographic variation in the bite of the NMW
  - The NMW should affect wages in low-wage areas more than in high-wage areas → policy impact on education and employment should be greater (in magnitude) in low-wage areas
  - Common trend assumption: in the absence of the policy, 16-17 year olds in low-wage areas would experience the same changes in average outcomes as those in high-wage areas
  - $Y_{it} = \alpha + \beta_1 \times after_t + \beta_2 \times treat_i + \delta_1 \times treat_i \times after_t + \gamma \times X_{it} + \varepsilon_{it}$

- Attempts to purge out the confounding effects of EMA
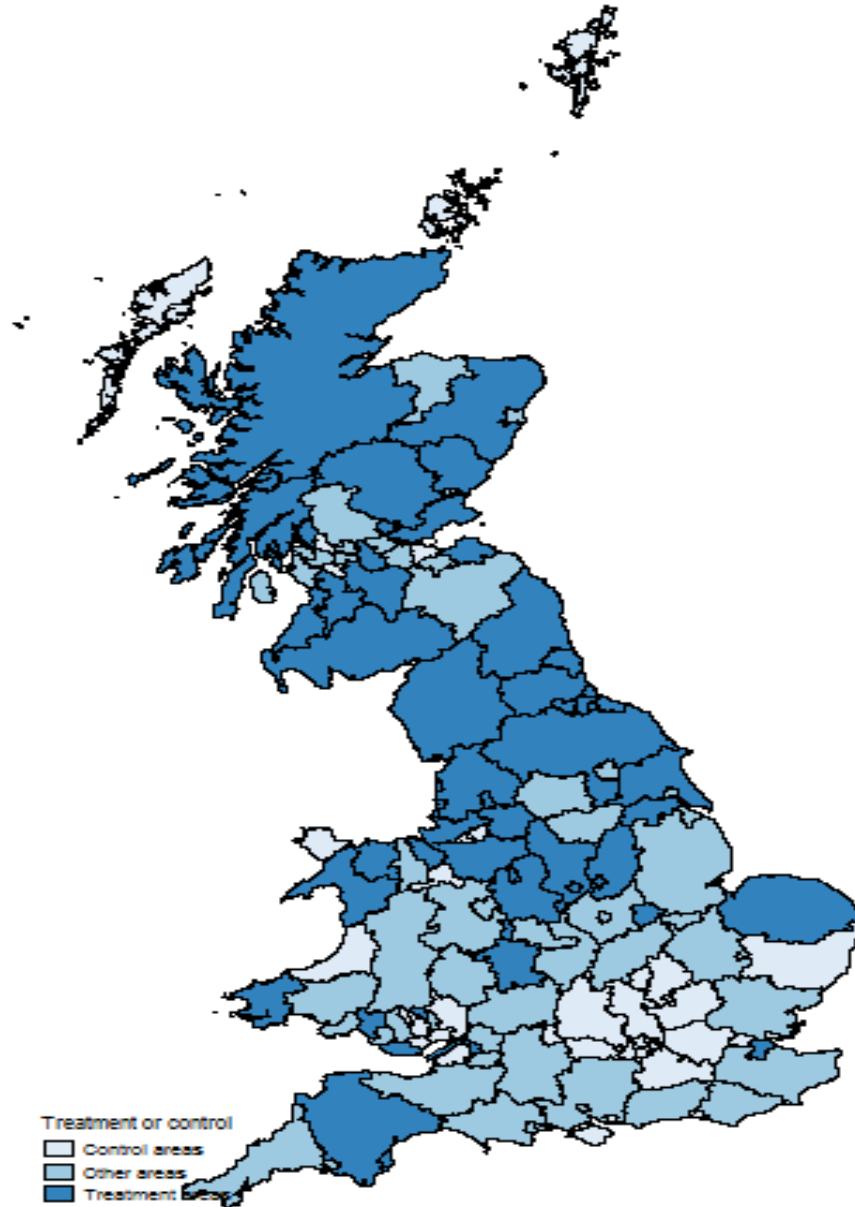
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Main specification

- $Y_{it} = \alpha + \beta_1 \times after_t + \beta_2 \times treat_i + \delta_1 \times treat_i \times after_t + \gamma \times X_{it} + \varepsilon_{it}$

- Binary outcomes: FTE, NEET, Work if in FTE, Work if not in FTE

- Labour Force Survey: "before" period = 2002Q4-2004Q3, "after" period = 2004Q4-2006Q3

- *Treat* = indicator of low-wage rather than high-wage areas, see next slide

- Sample of 16-17-year olds, excluding those in academic year 11

- Controls include gender, ethnicity, age measured in months, whether academic age was 16 or 17, highest level of qualification, whether achieved at least five GCSEs at grades A*–C, yearly and monthly dummies, and parents' employment status, income quartile and qualification levels.

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How we defined low-wage and high wage areas

- Choose a level of geography:
  - Need a level that exists in both ASHE and LFS
  - 11 regions, 141 unitary authorities/counties, 400+ local authorities, 600+ parliamentary constituencies, 32 boroughs in London
  - Big enough for there to be sufficient number of observations per cell
  - Settled for 170 Unitary Authorities/Counties/Boroughs
- Choose a local wage measure
  - 10th percentile of the local wage distribution among 16-21 year olds
- Rank areas by the local wage measure
  - 30% young people from the lowest-wage [highest-wage] areas form the treatment [control] group

Treatment vs Control areas
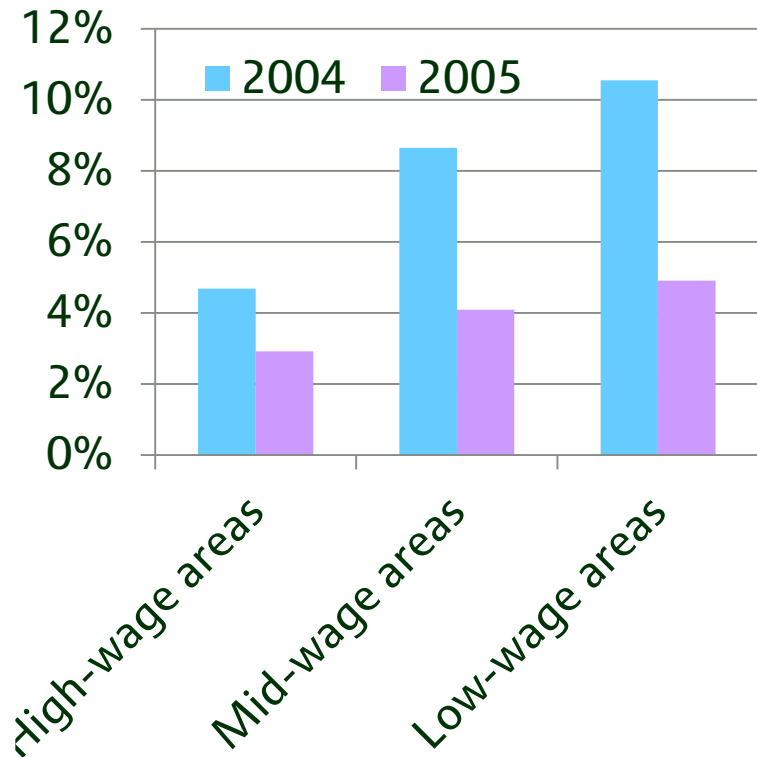Unitary Authority level

- Validity of our definition of treatment vs control areas:

1. Did the NMW lift the lower-end of youth wages in control areas more than in treatment areas?

2. How plausible is the common trend assumption?

Treatment or control
☐ Control areas
☐ Other areas
■ Treatment areas

Note. Both inner and outer London are in the Control group

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Changes to low pay between 2004 and 2005, by initial levels of local wages

Average hourly wage of 16–17-year-olds paid below £5/hour

Legend: 2004, 2005

Y-axis: £3.50, £3.60, £3.70, £3.80, £3.90, £4.00, £4.10, £4.20, £4.30

X-axis: High-wage areas, Mid-wage areas, Low-wage areas

Proportion of 16–17 year olds paid under £3.00/hour

Legend: 2004, 2005

Y-axis: 0%, 2%, 4%, 6%, 8%, 10%, 12%

X-axis: High-wage areas, Mid-wage areas, Low-wage areas

Based on ASHE 2004 and 2005 . Each bar is based on 600-850 observations

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Common trend?

Proportion of 16-17 year olds in full-time education

Low-wage areas   High-wage areas
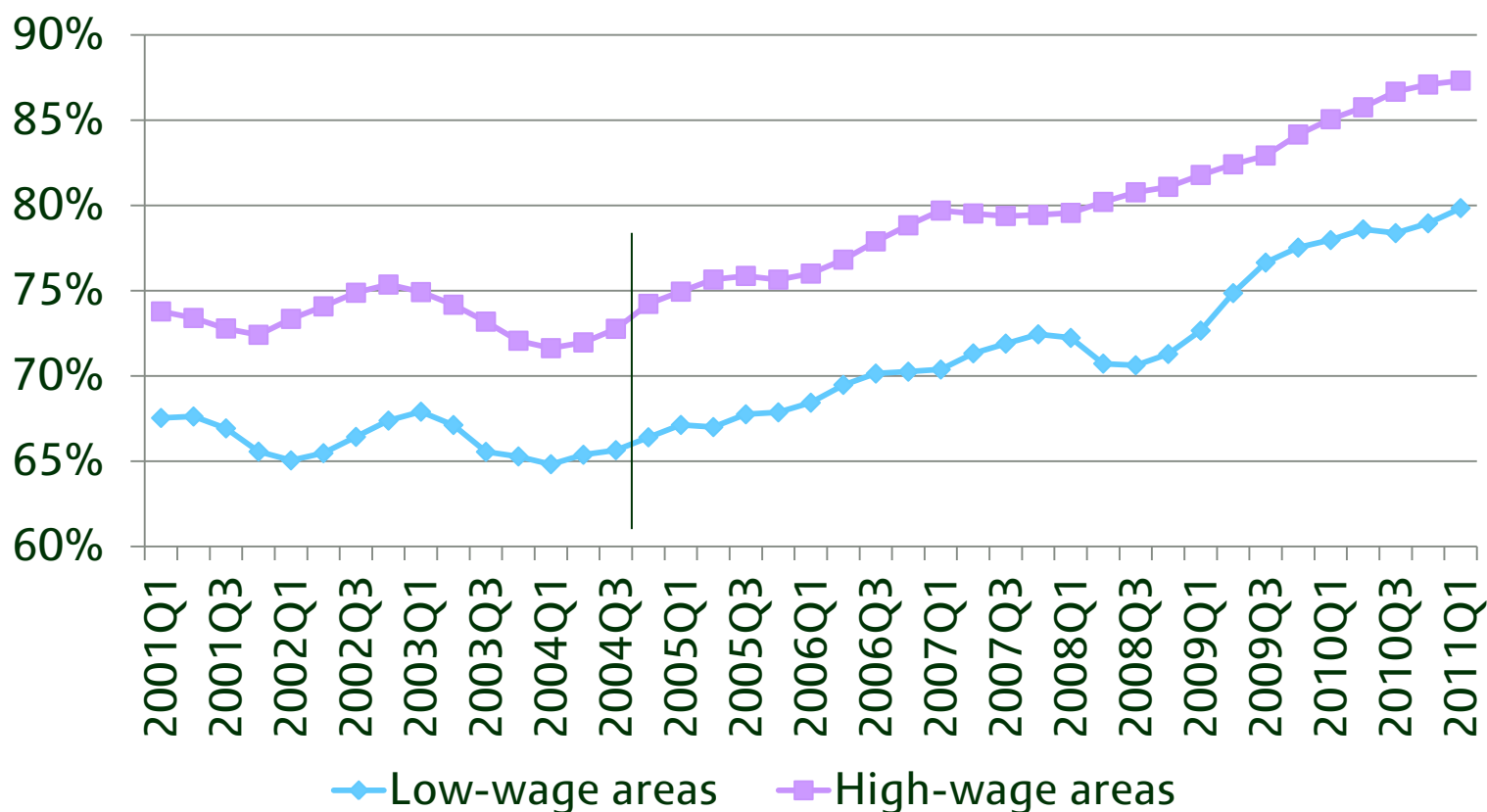
4-quarters moving average. The labelled quarter refers to the last one.

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Common trend?   Regressions in the "before" period

Table 1   P-values of the hypothesis that the difference in outcomes between treatment and control areas was constant from October 2002 to September 2004

Local wage measured at which percentile:	10th	15th	20th	25th
FTE	0.874	0.513	0.261	0.281
Work conditional on FTE	0.234	0.134	0.159	0.085
NEET	0.706	0.861	0.588	0.718
Work conditional on not in FTE	0.960	0.959	0.797	0.976

Each p-value relates to the joint significance of 7 interaction terms between the treatment dummy and 7 time dummies.

Same controls as in the main regression.

Common trend?   A placebo test

The regression is analogous to our main DD regression, except for the sample period.
Before: 2001Q1-2002Q3; After:2002Q4-2004Q3

Outcome:	FTE	NEET	Work if in FTE	Work if not in FTE
Low-wage × after	-0.00251	-0.00733	-0.00672	0.0361
	(0.0159)	(0.00908)	(0.0207)	(0.0299)
Sample size	22,180	22,180	15,335	6,714

Common trend in macro-economic conditions?

Between Oct.2003-Sept.2004 and Oct.2004-Sept.2005, employment rate among 18-25 year olds fell by 0.6ppts in the "low-wage" areas and by 0.3 ppts in the "high-wage" areas, suggesting that the general demand for young workers did not change differentially in low-wage vs high-wage areas.

Fall in employment rate between 2003-4 and 2004-5

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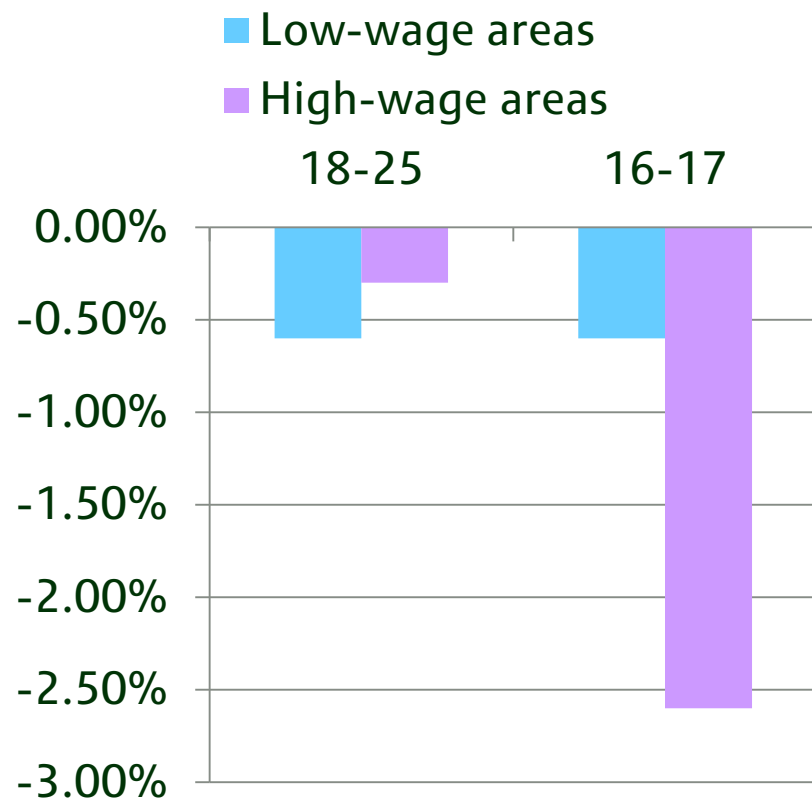
Main Results from the Linear Probability Model

Outcome:	FTE	NEET	Work if in FTE	Work if not in FTE
Low-wage × after	0.011	−0.0005	0.041**	0.022
	[0.016]	[0.009]	[0.020]	[0.031]
Sample size	23,317	23,317	16,499	6,660

Notes: Standard errors are clustered at the individual level and shown in brackets. *** indicates statistical significance at the 1% level, ** at the 5% level and * at the 10% level.

'Low-wage' is the dummy for low-wage areas (ranked according to the 10th percentile of the 16–21 pay distribution in the area). The 'after' dummy = 0 for 2002Q4–2004Q3 and = 1 for 2004Q4–2006Q3. This table presents coefficients on the interaction between the 'low-wage' and 'after' dummies. Self-employed individuals and unpaid family workers are excluded in regressions of outcomes other than FTE and NEET.

Controls include gender, ethnicity, age measured in months, whether academic age was 16 or 17, highest level of qualification, whether achieved at least five GCSEs at grades A*–C, yearly and monthly dummies, and parents' employment status, income quartile and qualification levels.

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Wages for those in FTE have risen more in low-wage areas than in high-wage areas

Average wages of 16- to 17-year-old workers who are also in full-time education in high- and low-wage areas

Legend: ■ before NMW ■ after NMW

In low-wage areas: £4.26 (before NMW), £4.80 (after NMW)
In high-wage areas: £4.67 (before NMW), £5.00 (after NMW)
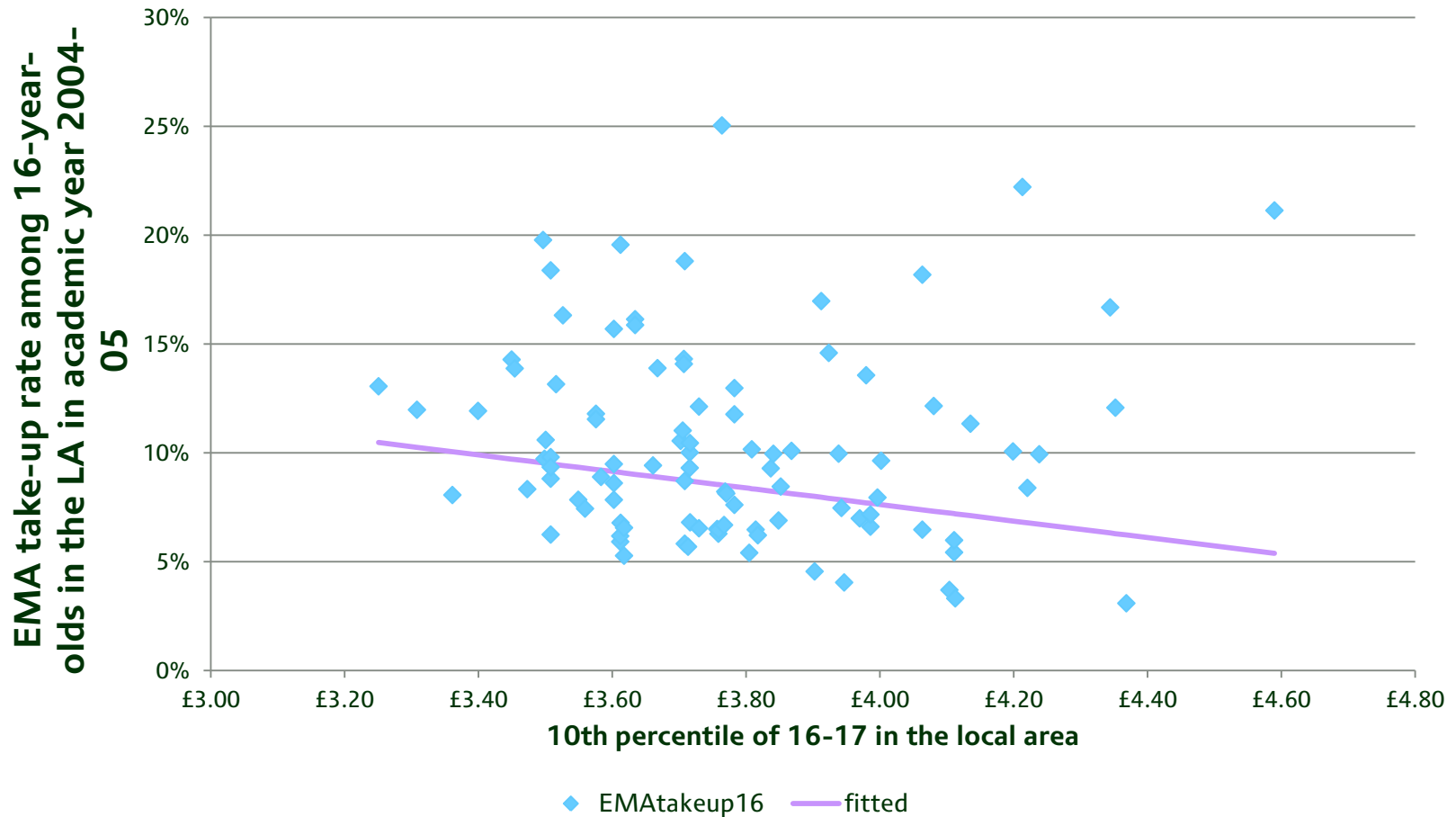ALL: £4.39 (before NMW), £4.85 (after NMW)

Source: Authors' calculations based on Labour Force Survey 2002Q4 to 2006Q3. The period 'before NMW' refers to 2002Q4–2004Q3; the period 'after NMW' refers to 2004Q4–2006Q3.

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Limitations

- Small numbers of 16-17-year-olds in work → tricky to measure the local wage and define treatment and control groups

- Education Maintenance Allowance may have differential impact in low-wage v.s. high-wage areas

  - the same amount of EMA payments would be more valuable in low-price areas

  - Lower nominal wages → more likely to qualify for the EMA

  - EMA can certainly affect the decision to stay on in education, and the need to work part-time while studying full-time

  - We expect EMA to have a greater impact in low-wage areas, so the bias caused by EMA in our diff-in-diff analysis should have the same sign as its causal impact on individuals

Within non-EMA-pilot areas, low-wage areas indeed tend to have higher EMA take-up

EMA take-up rate among 16-year-olds in the LA in academic year 2004-05 (y-axis)

10th percentile of 16-17 in the local area (x-axis)

◆ EMAtakeup16 ── fitted

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Recent attempts to disentangle the effects of NMW from EMA

- EMA was piloted in 1999-2001 in some LAs in England before it was rolled-out nationally in September 2004

  → In EMA pilot areas, the only relevant policy change is the introduction of NMW.

- EMA was rolled out from academic year 2004-05 for 16 year olds (when starting year 12), and for 17 year olds academic year 2005-06.

  → We may restrict the non-EMA-pilot sample by academic age and time period in order to disentangle the effects of NMW and EMA

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Clarifying the sub-samples for Diff-in-Diff analysis

Academic age (biological age always<18)	EMA Pilot areas	Period 2004 Q4-2005Q3	Period 2005Q4-2006Q3
16	Yes	NMW	NMW
17	Yes	NMW	NMW
16	No	NMW+EMA	NMW+EMA
17	No	NMW	NMW+EMA

- In pilot areas, both cohorts, before: 2002-4, after: 2004-6
- In non-pilot areas, academically 17 year olds, before: 2002-4, after:2004-5
- In non-pilot areas, academically 17 year olds, before: 2004-5, after 2005-6
- In non-pilot areas, academically 16 year olds, before: 2002-4, after 2004-6
 - Compare to the DiD estimate of the same cohort in pilot areas

If we look at EMA pilot areas only

Outcome:	FTE	NEET	Work if in FTE	Work if not in FTE	Combine work and FTE
Low-wage × after	0.0339	-0.0159	-0.00996	0.100	0.00334
	(0.0366)	(0.0253)	(0.0370)	(0.0643)	(0.0269)
Sample size	4,519	4,519	3,127	1,364	4,519

Notes: same specification as our main results. 2525 observations in treatment areas, 1994 in control areas

| Original resutls	0.011	−0.0005	0.041**	0.022	0.0335**
	[0.016]	[0.009]	[0.020]	[0.031]	(0.0158)
	23,317	23,317	16,499	6,660	23,317

- For the outcome FTE, we thought the bias from EMA should be positive and therefore the true impact of NMW should be slightly lower than our initial estimate of 1.1ppts ; not true here but big standard error

- For the outcome of Work if in FTE, we thought the bias from EMA should be negative due to income effect so the true impact of NMW should be higher than our initial estimate of 4.1ppts. But this is not a sensible outcome to look at if policy affects who goes into FTE.

- Note our original estimates are for GB, the EMA pilot areas may not be representative of GB.

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EMA pilot areas look very different from other areas

- In terms of outcomes
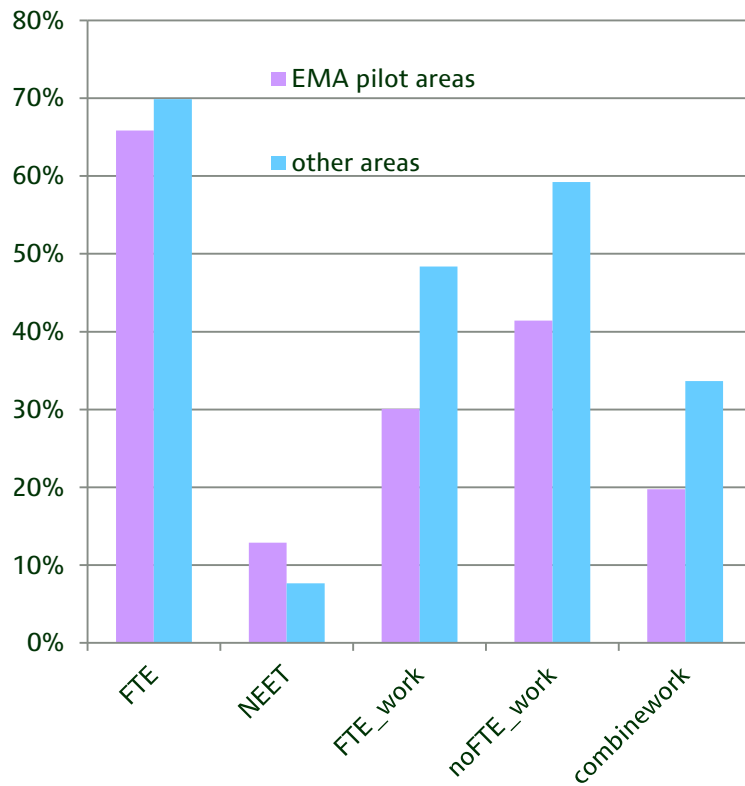
- And in terms of family background
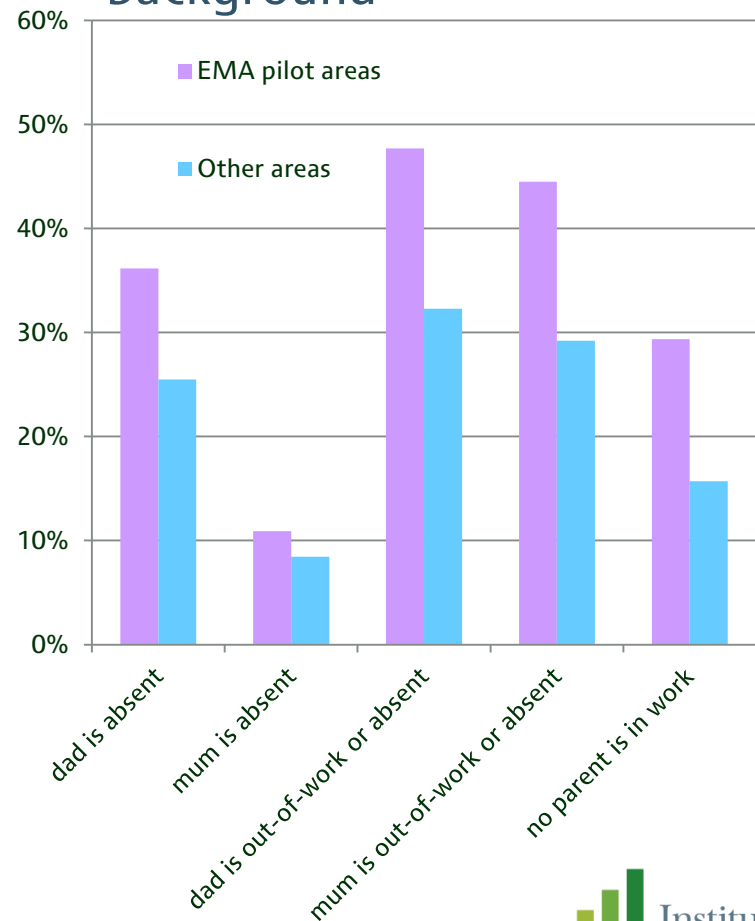
- The differences between EMApilot areas and other areas in the levels of economic variables do not necessarily mean that the impact of NMW should be different between the two.

- However, it does make us suspect that the impact would not be the same

- Assuming the causal impact of NMW is the same in EMA pilot areas as in other areas (henceforth referred as "the comparability assumption"), then we can compare estimates and see if the differences make sense...

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Diff-in-diff results for outcome FTE – by subgroup

Academic Age	EMApilot	Before period	After period	Estimate (s.e.)	Sample size	Interpretation
16 and 17	yes	2002Q4 - 2004 Q3	2004Q4- 2006Q3	0.0339 (0.0366)	4,519	NMW
16	yes	2002Q4 - 2004 Q3	2004Q4- 2006Q3	0.0193 (0.0431)	3,060	NMW
17	yes	2002Q4 - 2004 Q3	2004Q4- 2006Q3	0.0640 (0.0577)	1,459	NMW
16	no	2002Q4 - 2004 Q3	2004Q4- 2006Q3	0.00677 (0.0206)	12,546	NMW+EMA
17	no	2002Q4 - 2004 Q3	2004Q4- 2006Q3	-0.000424 (0.0264)	6,252	NMW+ partly EMA
17	no	2004Q4 - 2005Q3	2005Q4 - 2006Q3	0.0474 (0.0361)	3,139	EMA
17	no	2002Q4 - 2004 Q3	2004Q4- 2005Q3	-0.0247 (0.0313)	4,628	NMW

Diff-in-diff results for outcome "combine work and FTE"

Academic Age	EMApilot	Before period	After period	Estimate (s.e.)	Sample size	Interpretation
16 and 17	yes	2002Q4 - 2004 Q3	2004Q4- 2006Q3	0.00334 (0.0269)	4,519	NMW
16	yes	2002Q4 - 2004 Q3	2004Q4- 2006Q3	0.00878 (0.0315)	3,060	NMW
17	yes	2002Q4 - 2004 Q3	2004Q4- 2006Q3	0.00175 (0.0468)	1,459	NMW
16	no	2002Q4 - 2004 Q3	2004Q4- 2006Q3	0.0679*** (0.0219)	12,546	NMW+EMA
17	no	2002Q4 - 2004 Q3	2004Q4- 2006Q3	-0.00232 (0.0281)	6,252	NMW+ partly EMA
17	no	2004Q4 - 2005Q3	2005Q4 - 2006Q3	0.0164 (0.0385)	3,139	EMA
17	no	2002Q4 - 2004 Q3	2004Q4- 2005Q3	-0.0189 (0.0341)	4,628	NMW

Formally compare the policy effects in EMA-pilot areas versus in other areas for 16-year-olds

	FTE	NEET	Work if in FTE	Work if not in FTE	Combine work and FTE	Working at all	Work part-time	Work full-time
treatafter	0.00574	-0.00126	0.0898***	0.0326	0.0664***	0.0670***	0.0667***	-0.000910
	(0.0206)	(0.0123)	(0.0274)	(0.0442)	(0.0219)	(0.0240)	(0.0227)	(0.0147)
treatafter*EMApilot	0.00427	0.0125	-0.116**	0.0325	-0.0696*	-0.0763	-0.0636	-0.0131
	(0.0476)	(0.0317)	(0.0517)	(0.0922)	(0.0394)	(0.0468)	(0.0411)	(0.0307)
sample size	15,606	15,606	11,323	4,181	15,606	15,504	15,504	15,504

Note: sample includes academically 16-year-olds only; all regressions above have the same RHS variables; full-time is defined as working at least 30 hours/week;

- The regressions conditioning on FTE or not may not be valid if the policies affect who are in FTE.
- Minus these estimates = effects of EMA (if the comparability assumption holds)
  - Unclear why EMA would encourage employment more than it does to education
  - Some of those drawn by EMA into FTE may work part-time to supplement their income; but hard to imagine EMA causing anyone to drop out or encourage "existing" students to work

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Maybe EMA areas and other areas are not comparable at all?

- We would like to have a story as to why the causal impact of NMW on "combining work and FTE" should be more negative/ less positive in EMA-pilot areas

- We know there are more disadvantaged young people in EMA pilot areas than in others. Might the impact on "combining work and FTE" be more negative or less positive on disadvantaged people?

- To check if the impact of NMW vary by disadvantage we interact *treatafter* with an indicator of disadvantage and estimate for the sample of EMA pilot areas.

  – We were hoping to see a negative estimate for the interaction term, but all we got was positive (we have tired a few indicators)

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Summary

- Previous diff-in-Diff analysis found no policy impact on education participation, NEEThood, and employment among non-students; but positive impact on employment among students.

- Common trend seems plausible

- But findings subject to the confounding effects of EMA

- Looking at areas whose only policy change was NMW, we find positive and insignificant impact on education and minor effects on other outcomes.

- Our previous finding of positive employment effect appears to be driven by academically-16-year-olds in non-EMA-pilot areas. It is unclear whether the differences in estimated policy effects arise from differences between areas or some causal effect of EMA

  - We expect EMA to cause a bias of the opposite sign; and we don't have a theory in which NMW would have a more positive effect in non-pilot areas

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Questions? Comments?

BACK-UP, Falsification test, before 2004Q4-2006Q3, after: 2006Q4-2008Q3

	FTE	NEET	Work if in FTE	Work if not in FTE	Combine work and FTE	Work	Work part-time	Work full-time
Non-EMA Pilot areas								
treatafter	-0.00668	-0.00188	-0.00375	0.0585	0.00465	0.0159	-0.00146	0.0160
	(0.0171)	(0.0102)	(0.0227)	(0.0374)	(0.0184)	(0.0200)	(0.0190)	(0.0121)
EMA Pilot areas								
treatafter	-0.00855	-0.000711	0.0151	-0.171**	0.0131	-0.0270	0.00432	-0.0256
	(0.0369)	(0.0248)	(0.0375)	(0.0746)	(0.0288)	(0.0348)	(0.0310)	(0.0207)

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BACK-UP, Outcome: Combine work and FTE; sample: EMA pilot areas

Disadvantage indicator	Dad is absent	Dad is absent or not in work	No parent is in work	Parental earnings below the non-zero median
treatafter	-0.0325	-0.0308	-0.0148	-0.0245
	(0.0391)	(0.0451)	(0.0367)	(0.0733)
treatafter * disadvantage indicator	0.0782	0.0610	0.0497	0.0309
	(0.0523)	(0.0545)	(0.0502)	(0.0783)
Sample size	4,519	4,519	4,519	4,519

- The impact of NMW appears to be more positive for disadvantaged kids than other kids, contrary to our guess.

- We still don't have an explanation as to why the causal impact of NMW in EMA pilot areas should be much more negative than the impact in other areas

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