

The Effects of Pay Decentralisation on Teachers' Pay and Teacher Retention

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Motivation

- ▶ Teachers matter for students' short-run test achievement, and maybe for longer run non-test outcomes as well
- ▶ So delivering good education means attracting and retaining good teachers (and incentivising them to perform well)
 - ▶ this has been a problem in a number of countries, e.g. UK
 - ▶ Due to centralised pay determination?
 - ▶ as it is unable to respond to workers' outside options in local labour markets (Britton and Propper 2016)
 - ▶ STRB: "The current pay system is rigid, complex and difficult to navigate and does not support schools to recruit the high-quality teachers or leaders" (DfE 2012)

=> What is the effect of flexible pay on schools' ability to attract and retain effective teachers?

Today's talk

- ▶ The project investigates how the 2013/14 pay reforms in England affected
 - ▶ **teachers'**
 - ▶ **pay**, entry wage, wage progression;
 - ▶ **retention** and entry to the profession;
 - ▶ mobility within and across schools;
 - ▶ schools' ability to fill teacher vacancies;
 - ▶ pupil attainment.
- ▶ Today, we only present results for some teacher outcomes, and emphasise our empirical strategy and methods
 - ▶ Feedback more than welcome!

Outline

1. The reform and research questions
2. Literature and contributions
3. Data and Overview of the Empirical Strategy
4. Part I: Did schools flex their pay? – Classification of Schools
5. Part II: The Effect of Pay Flexibility – A DiD approach
6. Discussion and Next Steps

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Before the Reform: Seniority Based Pay

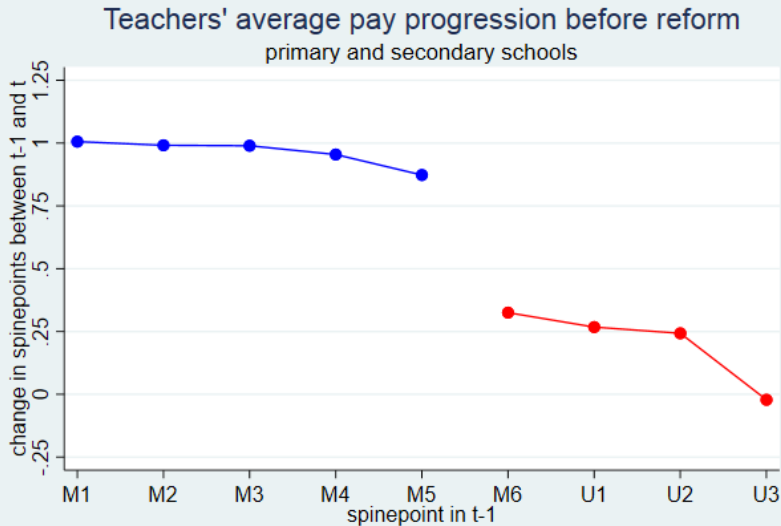
- ▶ Until 2012 (2013 for existing teachers): seniority based pay scales published every year by STRB, binding for LA maintained schools
 - ▶ Academies already had flexibility in the way they paid teachers

Pay Scale for Classroom Teachers (Main scale) 2012				
Scale point	Annual Salary England and Wales (excluding the London Area)	Annual Salary Inner London Area	Annual Salary Outer London Area	Annual Salary Fringe Area
	£	£	£	£
1	21,588	27,000	25,117	22,626
2	23,295	28,408	26,674	24,331
3	25,168	29,889	28,325	26,203
4	27,104	31,446	30,080	28,146
5	29,240	33,865	32,630	30,278
6	31,552	36,387	35,116	32,588

Source: DfE 2012

Before the Reform

Nearly automatic pay progression on the main pay scale



Sample: teachers with no gap years in between.

After the Reform: Flexibility Between Statutory Min/Max

- ▶ From 2013 (2014 for existing teachers): STRB only publishes min and max pay
 - ▶ schools determine individual teacher salaries flexibly between min and max
 - ▶ salaries are meant to be linked to excellence and performance improvement, with higher rewards and more rapid progression for the most able teachers

Main Pay Range 2014				
	Annual Salary			
	England and Wales (excluding the London Area)	Inner London Area	Outer London Area	Fringe Area
	£	£	£	£
Minimum	22,023	27,543	25,623	23,082
Maximum	32,187	37,119	35,823	33,244

Source: DfE 2014

The Reform – Some Comments

- ▶ Reform offers an *opportunity* and NOT a new mandate for schools
 - ▶ Schools could continue to shadow old pay scales (offered by unions)
 - ▶ Or they could use any form of flexibility in pay and recruitment – no guidance
- ▶ Reform: opportunity both to respond to local labour market tightness AND to link pay to performance
 - ▶ Our project aims to address both but P4P analysis may be limited by data
- ▶ Reform kicked in in 2013 for new teachers and in 2014 for existing teachers
 - ▶ Few new teachers (also: hard to identify them from data)
 - ▶ Based on what we see in the data, we will consider 2014 to be the first post-reform year

Today's talk – Research Questions

1. Did schools use these freedoms?
2. Empirically, how can we identify schools that did use those freedoms (the “adopters”) versus those who did not (the “non-adopters”)?
3. Which schools are the adopters?
4. DiD estimates for teacher pay and retention

(→ Whole Project Agenda)

Preview of Results

As a result of the reforms:

1. about 90% of the schools departed from seniority pay schedules
 - 1.1 14% speeding up pay progression
 - 1.2 36% slowing down pay progression
 - 1.3 38% mixing within school
2. secondary, larger, London, urban schools with more FSM students are more likely to depart
3. FTE base pay decreased slightly but heterogeneous effects:
 - 3.1 increased by 2% in schools speeding up progression
 - 3.2 decreased by almost 2% in schools that slowed down pay progression
4. No effects on retention, small cut back on hours

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Literature: Effect of teacher pay flexibility

1. ... on teacher salaries

- ▶ positive in Sweden (Willén 2019); negative in England (Sharpe et al. 2017; Burgess, Greaves and Murphy 2019); positive for high-VA teachers in Wisconsin (Biasi 2018)
- ▶ heterogeneous effects by local labour market characteristics in Sweden and England

2. ... on the composition of teachers

- ▶ positive in Wisconsin, zero in Sweden

3. ... on student achievement

- ▶ positive in Wisconsin and in England, zero in Sweden

(→ Literature in more detail)

This paper

1. Same reform and main dataset as Burgess, Greaves and Murphy (2019)
2. But distinct in two aspects:
 - 2.1 novel method for identification
 - 2.1.1 develop a direct measure of which schools adopted flexibility; identify strategies how schools adopted
 - 2.1.2 use the measure in a diff-in-diff framework for a comprehensive analysis of the reform impacts
 - 2.2 role of local labour markets (in progress)
 - 2.2.1 see what reduced form estimates imply for the teacher labour market structure
 - 2.2.2 acknowledge and fully explore the importance of local labour market dynamics by linking our adopter type variable to ASHE data

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- ▶ Schools Workforce Census (SWF)
 - ▶ Horizon: 2010-2016
 - ▶ 2010-12 = pre-period, 2014-16 = post-period (low quality data in 2013)
 - ▶ Sample:
 - ▶ schools that are LA controlled in 2012 but may switch to Academy status later
 - ▶ excluded schools that merged/split (<1%)
 - ▶ all classroom teachers in base sample schools in any given year
 - ▶ Variables used: spine points, FTE base and gross pay, teacher demography and qualification

(→ Data Issues in SWF)

Descriptive Statistics: Base Sample Schools in 2012

Variable	mean	sd	min	max	N
years in data	6.96	0.24	4	7	15,835
secondary	0.09				15,835
foundation	0.07				15,835
vol aided	0.23				15,835
vol controlled	0.14				15,835
academise after 2012	0.17				15,835
- converter	0.12				15,835
- sponsor-led	0.05				15,835
fringe London	0.07				15,835
inner London	0.06				15,835
outer London	0.05				15,835
urban	0.72				15,835
FTE teachers	13.97	15.99	0.2	158.46	15,835
FTE pupils	307.76	261.75	8	2191	15,560
teacher turnover	0.18	0.16	0	1	15,835
%FSM	17.95	13.79	0	75	15,018
exp on teachers	2161.97	453.78	1080.16	5767.92	14,705
total exp per pupil	4434.84	1076.69	2594.70	40023.73	15,561
exp ratio on teaching	0.65	0.16	0	1.06	15,561
budget balance	42.63	211.29	-9881.96	2496.68	15,561
ratio of grant income	0.97	0.03	0.41	1.05	15,561
payscale M	0.48	0.22	0	1	15,835
payscale U	0.48	0.22	0	1	15,835
payscale UQ	0.02	0.05	0	0.82	15,835
payscale ET/AST/LP	0.00	0.03	0	0.83	15,835
payscale L	0.00	0.01	0	0.60	15,835
payscale other	0.01	0.07	0	0.97	15,835

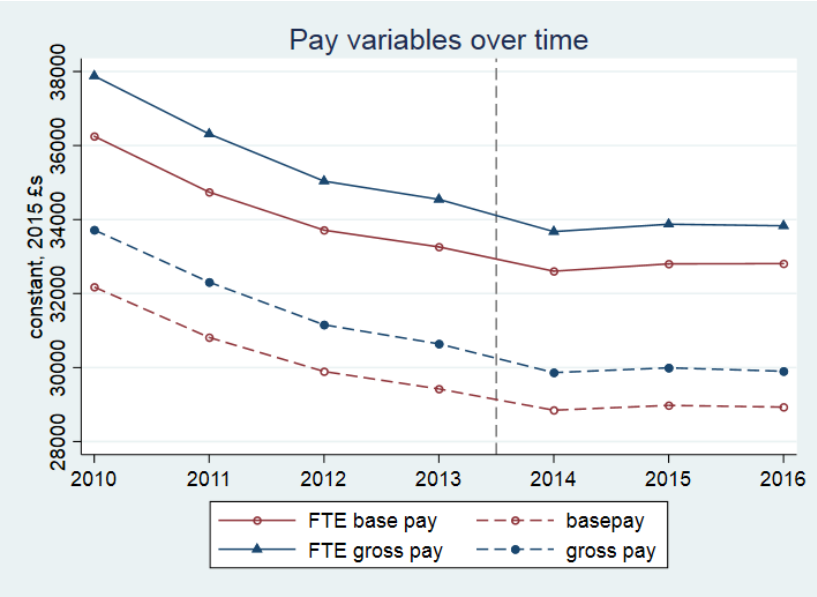
Note: Schools that are LA maintained in 2012 but may have academised afterwards.

Descriptive Statistics: Teachers

Variable	mean	sd	min	max	N
male	0.21				453,518
white British	0.81				454,020
age	35.75	11.06	22	62	454,005
under 30	0.42				454,005
over 45	0.24				454,005
payscale M	0.55				454,020
payscale U	0.33				454,020
payscale UQ	0.06				454,020
payscale ET/AST/LP	0.01				454,020
payscale L	0.00				454,020
payscale other	0.04				454,020
payscale missing	0.01				454,020
number of years in sample	4.00	2.23	1	7	454,020
avg FTE	0.89	0.20	0.00	1.2	454,020
number of schools worked at	1.21	0.47	1	6	454,020

Note: School staff in “classroom teacher” post who at least in one year works in a base sample school.
Age and pay scale reported for first year observed.

Descriptive Statistics: Teacher Pay over Time



(→ Teacher Retention over Time)

Other Data

- ▶ STRB pay documents, union pay documents
- ▶ Whole school model pay policies LAs offer to schools (ongoing hand-collection)
- ▶ CFR school finance data
- ▶ ASHE – will be the other key dataset
- ▶ NPD

Overview of the Empirical Strategy

1. Part I: Did schools flex their pay? – Classification of Schools
 - 1.1 Construct counterfactual pay
 - 1.2 Classify schools as adopters or non-adopters
2. Part II: The Effect of Pay Flexibility – A DiD approach
 - ▶ using adopters and non-adopters as T/C groups

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Empirical Strategy – Part I: Did schools flex their pay?

A classification of schools

1. Construct counterfactual pay, i.e. pay if reform had not happened
 - 1.1 estimate counterfactual spine points: predict individual teacher's (counterfactual) pay point on the pay ladder had the reforms not taken place
 - ▶ use individual teacher's average past progression and average past progression in the school through the pay ladder
 - More details
 - 1.2 merge in union-recommended pay schedule using counterfactual spine points

⇒ We now have both “actual and “counterfactual” (or: “observed” and “scheduled”) (full-time equivalent) base pay for every teacher.

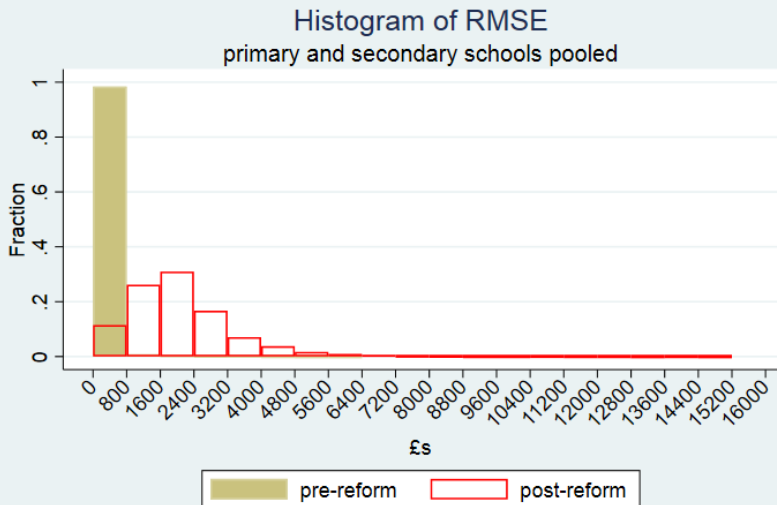
Empirical Strategy – Part I: Did schools flex their pay?

A classification of schools

1. Construct counterfactual pay
2. Classify schools as adopters or non-adopters
 - 2.1 We use the deviations of actual (“observed”) pay from counterfactual (“scheduled”) pay for each teacher, and
 - 2.2 aggregate these deviations to the school level: RMSE when predicting observed pay with scheduled pay →More details

Results

Schools did use the freedom to flex their pay



School-level root mean squared error (RMSE) of observed pay predicted by scheduled pay.
Sample: schools that were LA-maintained in 2012 but may have academised later.

Empirical Strategy – Part I: Did schools flex their pay?

A classification of schools

1. Construct counterfactual pay
2. Classify schools as adopters or non-adopters
 - 2.1 We use the deviations of actual (“observed”) pay from counterfactual (“scheduled”) pay for each teacher, and
 - 2.2 aggregate these deviations to the school level: RMSE when predicting observed pay with scheduled pay
 - 2.3 Then, we use this school-level measure
 - ▶ to classify schools based on (arbitrary) cutoffs
 - then perform sensitivity analysis for cutoff
 - ▶ or, as a continuous “treatment” variable (in progress)

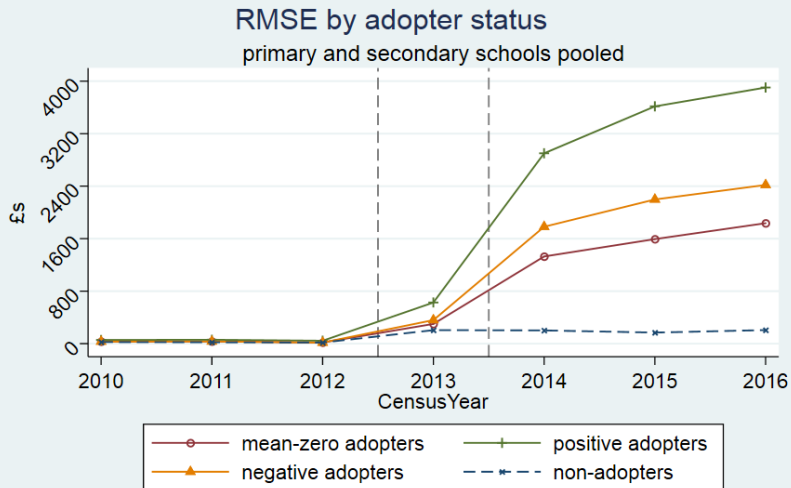
Classification

Actual classification based on following logic:

1. **non-adopters**, who continued to pay teachers based on seniority as if reforms did not happen – no change in mean and no change in within school variance;
2. **mean-zero adopters**, who kept average pay progression as would have been expected based on the pre-reform pay scheme but increased within-school variation in pay progression;
3. **positive adopters**, who speeded up pay progression on average post-reform;
4. **negative adopters**, who slowed down pay progression on average.

→More details

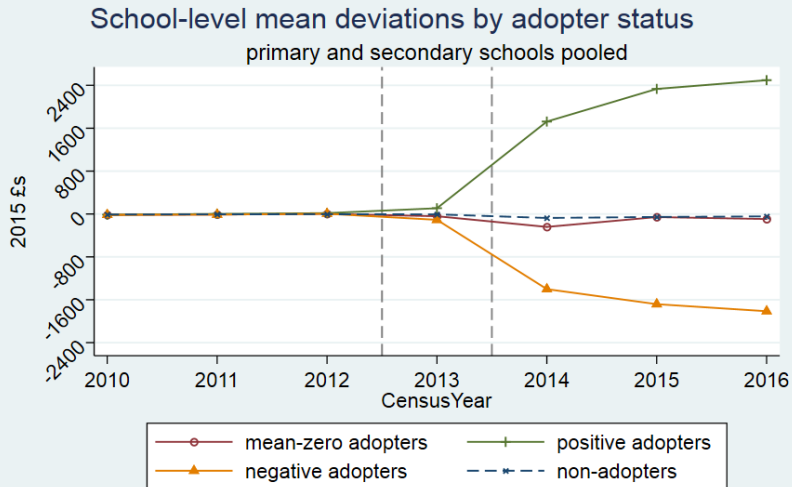
Results – Adopter types vs. non-adopters: RMSE over time



School-level root mean squared error (RMSE) of observed pay predicted by scheduled pay.
Sample: schools that were LA-maintained in 2012 but may have academised later.
5784 mean-zero-, 2177 positive-, 5482 negative adopter, and 1719 non-adopter schools

Results – Adopter strategies 1

Adopter types vs. non-adopters: Mean deviation over time

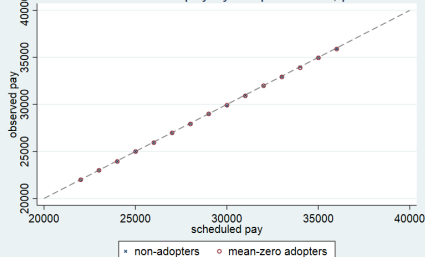


School-level root mean squared error (RMSE) of observed pay predicted by scheduled pay.
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5784 mean-zero-, 2177 positive-, 5482 negative adopter, and 1719 non-adopter schools

Results – Adopter strategies 2

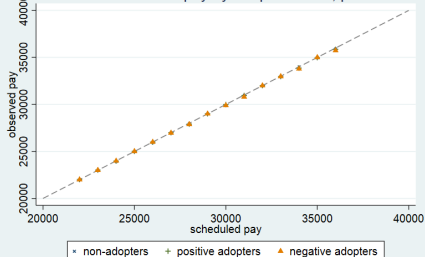
Adopter types vs. non-adopters: Observed vs. scheduled pay pre-reform

Observed and scheduled pay by adopter status, pre-reform



Adopter status defined based on RMSE of observed pay predicted by scheduled pay.

Observed and scheduled pay by adopter status, pre-reform

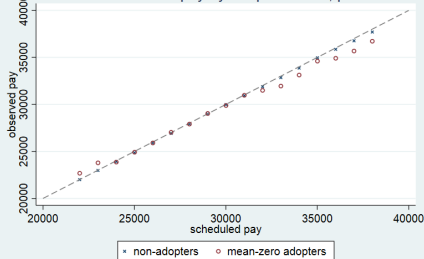


Adopter status defined based on RMSE of observed pay predicted by scheduled pay.

Results – Adopter strategies 2

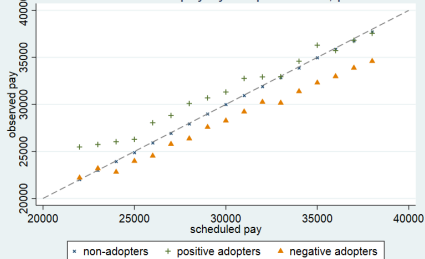
Adopter types vs. non-adopters: Observed vs. scheduled pay post-reform

Observed and scheduled pay by adopter status, post-reform



Adopter status defined based on RMSE of observed pay predicted by scheduled pay.

Observed and scheduled pay by adopter status, post-reform



Adopter status defined based on RMSE of observed pay predicted by scheduled pay.

Results – Number of schools as classified

	Primary	Secondary	Total
Non-adopter	1,676 (12%)	43 (3%)	1,719 (11%)
Mean-zero adopter	5,112 (37%)	672 (46%)	5,784 (38%)
Positive adopter	2,025 (15%)	152 (10%)	2,177 (14%)
Negative adopter	4,876 (36%)	606 (41)	5,482 (36%)
Total	13,689 (100%)	1,473 (100%)	15,162 (100%)

Results – Which schools adopted flexibility?

Pre-reform school characteristics

- ▶ Adoption positively correlated with:
 - ▶ London, urban
 - ▶ secondary
 - ▶ size
 - ▶ young teacher workforce
 - ▶ % FSM
 - ▶ level and growth in teacher turnover
 - ▶ total per pupil expenditure, spending on teachers, grant income
 - ▶ academisation afterwards (sponsor-led)
 - ▶ LA mean wages, number of academies in LA
- ⇒ Control for these in the DiDs below.
- ▶ Adoption negatively correlated with:
 - ▶ KS intake and results
 - ▶ growth in % FSM

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Empirical Strategy – Part II: The Effect of Pay Flexibility

A Difference-in-Differences (Event study) approach

- ▶ We now analyse the effects of the pay reform in a DiD framework using adopters and nonadopters as T/C groups:

$$y_{it} = \alpha_0 + \sum_{\tau \neq 2012} \alpha_{\tau} \times \text{year}_{\tau} + \sum_a \beta^a \times D_{s(i)}^a + \\ + \sum_a \sum_{\tau \neq 2012} \gamma_{\tau}^a \times \text{year}_{\tau} \times D_{s(i)}^a + X'_{it} \delta + \epsilon_{it},$$

where y_{it} is outcome of teacher i in year t :

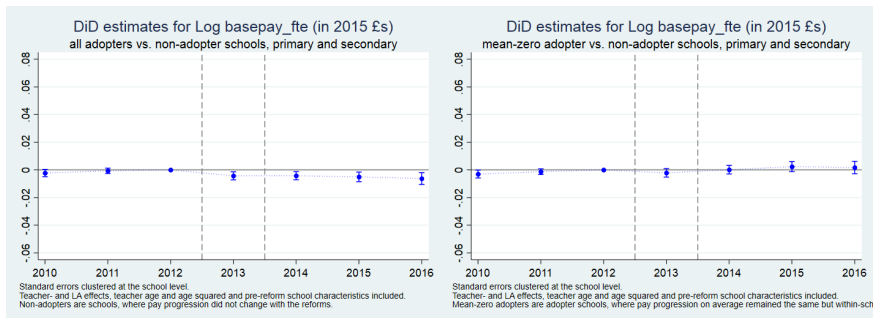
- ▶ log of FTE base pay, gross pay (in constant 2015 £s)
- ▶ FTE contracted hours
- ▶ indicator for staying at the same school by next year (retention)

and $D_{s(i)}^a$ is a set of dummies for adopter type of teacher i 's school s .

- ▶ Coefficients of interest: γ_{τ} 's (reference year: 2012)
- ▶ SEs clustered at the school level
- ▶ Identification assumption: parallel pre-trends, which we verify by eyeballing

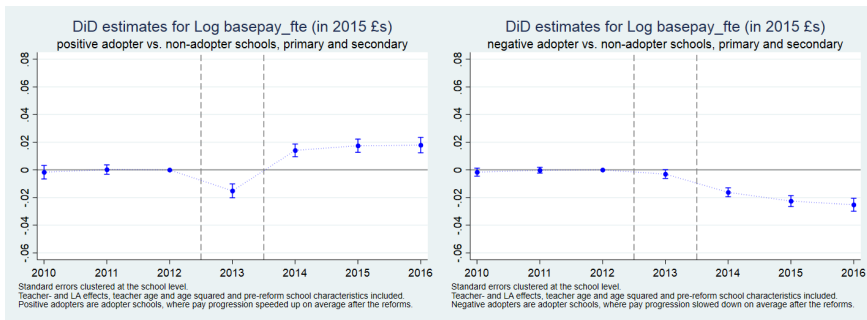
Results – DiD on FTE base pay

Slight overall decrease in FTE base pay



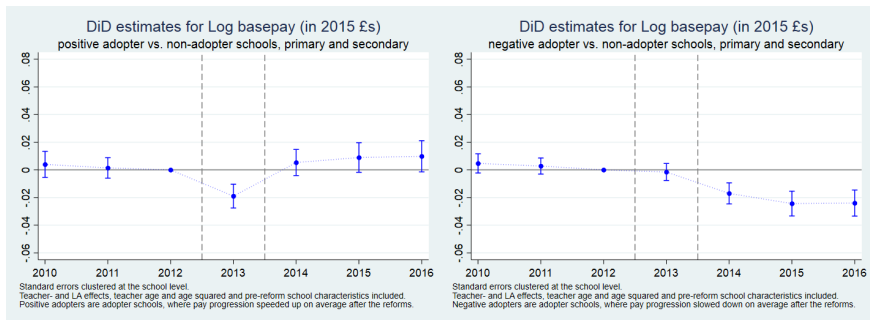
Results – DiD on FTE base pay

2% increase (decrease) for positive (negative) adopters



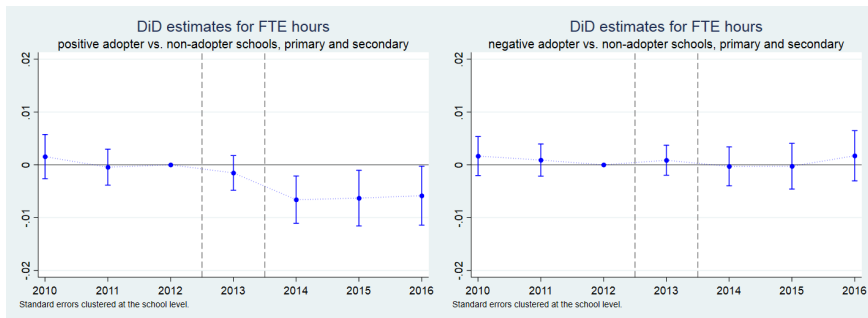
Results – DiD on base pay

Smaller effects than on base pay



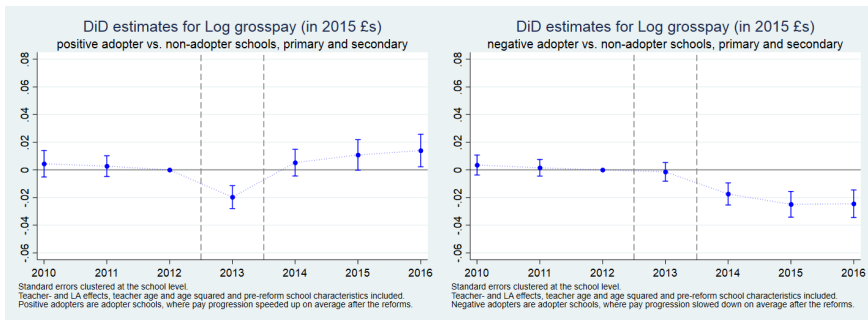
Results – DiD on FTE contracted hours

Positive adopters cut back hours by 0.5 %point



Results – DiD on gross pay

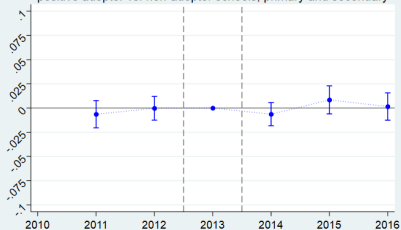
Same as base pay => no adjustment in additional pay components



Results – DiD on teacher retention

No effects

DiD estimates for retained in same school by next year
positive adopter vs. non-adopter schools, primary and secondary

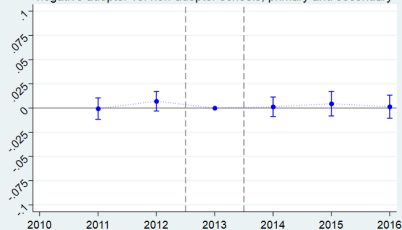


Standard errors clustered at the school level.

School effects, teacher demographic and pre-reform LA characteristics included.

Positive adopters are adopter schools, where pay progression speeded up on average after the reforms.

DiD estimates for retained in same school by next year
negative adopter vs. non-adopter schools, primary and secondary



Standard errors clustered at the school level.

School effects, teacher demographic and pre-reform LA characteristics included.

Negative adopters are adopter schools, where pay progression slowed down on average after the reforms.

Discussion

Labour supply elasticity to the schools

- ▶ Following Manning (2003), we can recover the labour supply elasticity to individual schools. Using the estimates for positive adopters:

$$\hat{\epsilon}^{ss/s} = -2 \frac{-\hat{\gamma}_{\text{retention/separation rate}}^{DID}}{\hat{\gamma}_{\log \text{ pay}}^{DID}} \approx 0.$$

- ▶ This implies an inelastic labour supply suggesting that schools have strong monopsony power over teachers in England.
=> local labour market conditions may play a big role!
 - ▶ see Next steps...

Next Steps

1. Methods

- ▶ robustness of the treatment classification
 - ▶ robustness to cut-off/continuous “treatment”
 - ▶ simulation to get an idea about misclassification (DGP?)
- ▶ better understand post-reform, school-level pay policies
- ▶ longer pre-trends in DiD from ASHE

2. Substantive

- ▶ other outcomes
- ▶ explore the role of local labour markets by exploiting ASHE
 - ▶ we will match the SWF-derived school-level treatment indicator to ASHE workplace, on postcode
 - ▶ identify school-specific labour markets using TTWAs
- ▶ role of school competition

Conclusion

As a result fo the 2013-14 teacher pay decentralisation in England:

- ▶ about 90% of the schools departed from seniority pay schedules
 - ▶ 14% speeding up pay progression
 - ▶ 36% slowing down pay progression
 - ▶ 38% mixing within school
- ▶ FTE base pay decreased slightly but heterogeneous effects:
 - ▶ increased by 2% in schools speeding up progression
 - ▶ decreased by almost 2% in schools that slowed down pay progression
- ▶ No effects on retention, small cut back on hours, no adjustment in additional pay components

Thank you!

Project Agenda

Assignment practices based on student observables

- ▶ Evaluate teacher pay reforms introduced in England in 2013
- ▶ Research questions:
 1. How did school-level teacher pay and variation in pay evolved before and after the introduction of pay-reforms?
 2. Which schools did move away from the old pay structure in response to the reforms and how do they differ from schools that did not?
 3. How may the pay reforms have affected
 - ▶ schools' ability to fill teacher vacancies;
 - ▶ teacher entry wages;
 - ▶ teachers' wage progression;
 - ▶ teacher retention and entry to the profession;
 - ▶ teacher mobility within and across schools?
 4. Are pay reforms are linked to changes in teacher characteristics through changes in those entering and leaving the profession?
 5. How may the pay reforms have affected average student attainment at the school level in the short-term?

Literature 1

- ▶ Biasi (2018)
 - ▶ Wisconsin Act 10: gave local districts the option to switch to flexible pay setting ie. from collective bargaining to individual wage negotiation
 - ▶ Those that did saw big increase in pupil attainment (value-added)
 - ▶ 54% = effort; 46% = sorting
- ▶ Willén (2019): shift from collective bargaining to individual wage negotiation in Sweden
 - ▶ Schools given no choice
 - ▶ Across-the-board increase in teacher wages post-reform relative to college educated non-teachers in pre-reform period
 - ▶ Schools switch resources from non-salary to salary items
 - ▶ No impact on pupil attainment
 - ▶ Willén attributes this to switch in resources (implying investments in non-salaries are suboptimal)

Literature 2

- ▶ Burgess et al. (2019): move away from STRB recommended scales towards individual wage negotiation for teachers in England in 2013/14
 - ▶ Post-reform data to 2015
 - ▶ Across-the-board decline in teacher wages relative to counterfactual predictions under centralised regime
 - ▶ Teacher pay a declining proportion of overall school expenditures
 - ▶ Findings are opposite to Willén
- ▶ But local labour markets play an important role in pay determination post-reform, with teacher wages rising (falling less) in Sweden (England) where local labour markets offered high outside wage options

(→ Back)

Data Issues in SWF

1. Teacher records aggregated to main job per year
=> Get disaggregated data (in progress)

Data Issues in SWF

1. Teacher records aggregated to main job per year
2. Pay is available rounded to the nearest £1,000
=> Round scheduled pay similarly

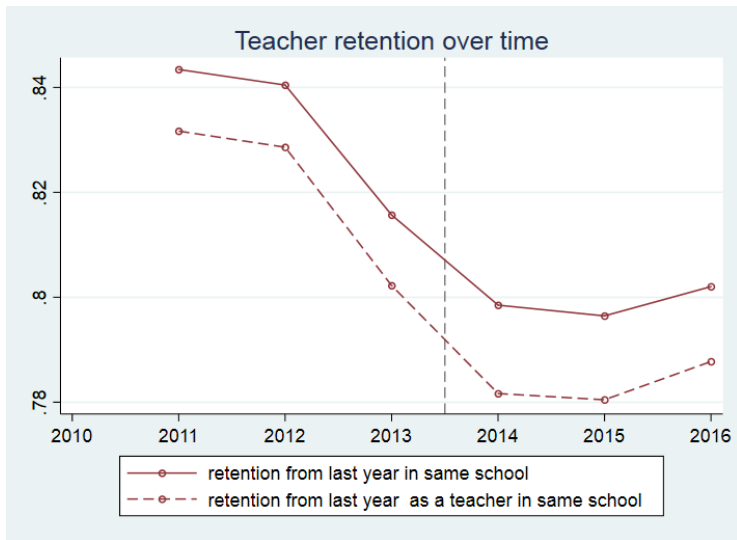
Data Issues in SWF

1. Teacher records aggregated to main job per year
 2. Pay is available rounded to the nearest £1,000
 3. What is reported to DfE by schools
 - ▶ changes with the reform
 - ▶ up until 2012, schools report spine points, DfE links base pay
 - ▶ in 2013, schools report both spine points and base pay
 - ▶ from 2014 onwards, schools report base pay
 - ▶ may differ by school
 - ▶ schools use different softwares for reporting
 - ▶ amount of measurement error will likely increase with the reform and this may correlate with adopting flexibility
- => Use 2013 to bound the role of measurement error
- => Use a flag variable for software versions (in progress)

Data Issues in SWF

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 - ▶ may differ by school
 - ▶ schools use different softwares for reporting
 - ▶ amount of measurement error will likely increase with the reform and this may correlate with adopting flexibility
4. Number of teachers we see per school may be small
=> Use statistical procedures to account for that?
Note: Positive but statistically and economically insignificant relationship between the number of teachers and the measure we use to classify schools

Descriptive Statistics: Teacher Retention over Time



(→ Back)

1. Constructing counterfactual pay

i.e. pay if reform had not happened

- ▶ We estimate the following regression for years 2011, 2012, 2013:

$$\Delta \text{spinepoint}_{it} = \sum_s \sum_{p=1}^5 \beta_{sp} \times W_{it}^s \times D_{it-1}^p + \varepsilon_{it},$$

where i is teacher, t is year, and W_{it}^s is a set of dummies indicating if teacher i works in school s in year t , while D_{it-1}^p is another set of dummies indicating if teacher i was on spine point p in year $t - 1$.

- ▶ Counterfactual progressions are predicted as

$$\text{progression}_{it} = \hat{\beta}_{sp} + \frac{1}{M} \sum_{\tau: 1 \leq p(i, \tau-1) \leq 5} \hat{\varepsilon}_{it},$$

- ▶ and thus, counterfactual spine points for years 2014, 2015 and 2016 are

$$cf \text{spinepoint}_{it} = int \left(\text{spinepoint}_{it-1} + \text{progression}_{it} \right).$$

- ▶ This procedure gives us counterfactual spine points for 91%, 89% and 87% of the teacher sample in years 2014-2016.

2. Classifying schools by whether they used pay flexibility

Construct a school-level measure of average difference between actual and counterfactual pay

We formalize this idea by computing the root mean squared error (RMSE) of observed pay when predicted by scheduled pay in every school for the post-reform period (2014-16):

$$\text{RMSE}_s = \sqrt{\frac{\sum_{i,t \text{ s.t. } t \in \{2014, 2015, 2016\} \text{ and } s \equiv S(i,t)} (\text{observed pay}_{it} - \text{scheduled pay}_{it})^2}{n_s}}$$

- ▶ RMSE=0 for schools who continued with seniority pay (continued to follow union-recommended pay schedule)
- ▶ To see the first-stage effect of the reform, we compute the same object for each year between 2010-2016 and also for the whole pre-reform period (2010-2012).
 - ▶ see next...

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2. Classifying schools by whether they used pay flexibility

Actual classification

- ▶ We assume measurement error in observed pay and (due to prediction) scheduled pay
=> choose £800 as plausible value of measurement error – see justification later
- ▶ Final classification of schools accounts for this:
 - ▶ non-adopters: $RMSE < 800$ (and so $-800 < \text{Mean Dev} < 800$);
 - ▶ mean-zero adopters: $RMSE > 800$ but $-800 < \text{Mean Dev} < 800$;
 - ▶ positive adopters: $RMSE > 800$ but $\text{Mean Dev} > 800$;
 - ▶ negative adopters: $RMSE > 800$ but $\text{Mean Dev} < -800$.
- ▶ We explore sensitivity to cut-off value and in a reasonable range, find few substantive differences in findings

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