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

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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
▶ ... and the implications of this on retention and the quality of teaching workforce in schools.
Outline

1. Institutional background and the reform
2. Literature
3. Data
4. Part I: The Effect of the Pay Reforms
5. Part II: Implications
6. Discussion and Next Steps
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Institutional background
Schooling in England

- Compulsory schooling age: 5-18
- School phases:
  1. Primary school: age 5-11
  2. Secondary school: age 12-16
  3. Sixth form or further education colleges: age 17-18
- Funding:
  - state funded: LA maintained schools, academies
  - independent (private)

(→ Number of schools)
(→ Number of pupils)
(→ Number of teachers)
Institutional background
State-funded Schools in England

- **Local authority** (LA, ~ school district) *maintained*
  - funding from LA
  - required to follow national curriculum, government regulations on school day and year, teacher pay and conditions

- **Academies** (~ charter schools)
  - funding straight from central government
  - accountable
  - flexibility on curriculum and instruction time, teacher pay and conditions and credentials
  - existing LA schools converting (rather than new schools opening up)

(→ Share of LA maintained schools)
(→ Share of LA maintained school teachers)
The 2013/2014 Teacher Pay Reform

“to reduce the rigidity of the pay system such that it best supports the recruitment and retention of high quality teachers in all schools” (M. Gove, Secretary of State for Education)
Environment: public sector pay freeze and low retention
Before the Reform: Seniority Based Pay

- Until 2013: 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

<table>
<thead>
<tr>
<th>Scale point</th>
<th>Annual Salary England and Wales (excluding the London Area)</th>
<th>Annual Salary Inner London Area</th>
<th>Annual Salary Outer London Area</th>
<th>Annual Salary Fringe Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>£21,588</td>
<td>£27,000</td>
<td>£25,117</td>
<td>£22,626</td>
</tr>
<tr>
<td>2</td>
<td>£23,295</td>
<td>£28,408</td>
<td>£26,674</td>
<td>£24,331</td>
</tr>
<tr>
<td>3</td>
<td>£25,168</td>
<td>£29,889</td>
<td>£28,325</td>
<td>£26,203</td>
</tr>
<tr>
<td>4</td>
<td>£27,104</td>
<td>£31,446</td>
<td>£30,080</td>
<td>£28,146</td>
</tr>
<tr>
<td>5</td>
<td>£29,240</td>
<td>£33,865</td>
<td>£32,630</td>
<td>£30,278</td>
</tr>
<tr>
<td>6</td>
<td>£31,552</td>
<td>£36,387</td>
<td>£35,116</td>
<td>£32,588</td>
</tr>
</tbody>
</table>

Source: DfE 2012
Before the Reform

Nearly automatic pay progression on the main pay scale

Pre-reform spine progression on main payscale
Base sample schools, 2010-12

Standard errors clustered at the LA level.
N primary=79895, N secondary=39578
Horizontal black solid line at 1 marks (hypothetical) automatic progression.
After the Reform: Flexibility Between Statutory Min/Max

- From 2014: 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

<table>
<thead>
<tr>
<th>Main Pay Range 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual Salary</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>England and Wales</strong></td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
</tbody>
</table>

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
  - P4P analysis may be limited by data => focus on the role local labour markets in propagating the effects of pay decentralisation (next steps)
- Reform kicked in in 2014, in 2013 there may have been anticipation effects
Today’s talk – Research Questions

1. How did the reform impact teachers’ pay?
2. Did schools use the freedoms to set pay?
3. Empirically, how can we measure the extent to which schools “adopted” flexibilities?
4. What predicts the intensity of adoption?
5. What are the implications of the pay impact on the teaching workforce?
Preview of Results

- Overall, there was a 1-2% decline in pay relative to counterfactual.
- Vast majority of schools departed from the seniority pay schedule
  - more than half let their pay drift down relative to counterfactual
- Schools that let their pay drift downwards by more, experienced:
  - a higher pay cut
  - a drop in their retention rate
  - a decline in the fraction of qualified teachers
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1. Institutional background and the reform
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1. ... on teacher salaries
   ▶ positive in Sweden (Willén 2020); negative in England (Sharpe et al. 2017; Burgess et al. 2019); positive for high-VA teachers in Wisconsin (Biasi forthcoming)
   ▶ heterogeneous effects by local labour market characteristics in Sweden and England
      ▶ Burgess et al. (2019) exploit the heterogeneity in pre-reform local labour market wages to find that in high-wage markets the reform had positive effects on teacher pay, retention and pupil achievement.

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
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**Data: School Workforce Census (SWF)**

- **Snapshot of linked school-teacher data in each November**
  - all state-funded schools
  - modules: contract, qualifications, curriculum, absences, school vacancies [low quality]
  - not allowed to link to pupil achievement at the teacher level
- **Horizon: 2010-2016**
  - 2010-12 = pre-period, 2014-16 = post-period (low quality data and potential anticipation effects in 2013)
- **Sample:**
  - schools that are LA maintained in 2012 but may switch to Academy status later
  - excluded schools that merged/split (<5%)
  - classroom teachers working at least 0.5 FTE in base sample schools
- **Variables used:** spine points, FTE base pay (in constant, 2015 £s), teacher demography and qualification (→ Data issues in SWF)
## Descriptive Statistics: Base Sample Schools in 2012

<table>
<thead>
<tr>
<th>Variable</th>
<th>Primary schools</th>
<th>Secondary schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>15,313</td>
<td>1,611</td>
</tr>
<tr>
<td>years in data</td>
<td>6.97 (0.24)</td>
<td>6.90 (0.46)</td>
</tr>
<tr>
<td>academise after 2012</td>
<td>0.16</td>
<td>0.32</td>
</tr>
<tr>
<td>inner London</td>
<td>0.06</td>
<td>0.09</td>
</tr>
<tr>
<td>outer London</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>fringe London</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>rest of England</td>
<td>0.83</td>
<td>0.81</td>
</tr>
<tr>
<td>urban</td>
<td>0.70</td>
<td>0.85</td>
</tr>
<tr>
<td>FTE pupils</td>
<td>244 (136)</td>
<td>935 (374)</td>
</tr>
<tr>
<td>% free school meal</td>
<td>12.8 (10.4)</td>
<td>14.4 (9.1)</td>
</tr>
<tr>
<td>FTE teachers</td>
<td>10 (6)</td>
<td>55 (23)</td>
</tr>
<tr>
<td>frac on payscale M</td>
<td>0.47 (0.24)</td>
<td>0.36 (0.16)</td>
</tr>
<tr>
<td>frac on payscale U</td>
<td>0.46 (0.24)</td>
<td>0.54 (0.19)</td>
</tr>
<tr>
<td>retention rate</td>
<td>0.82 (0.16)</td>
<td>0.85 (0.09)</td>
</tr>
<tr>
<td>expenditure on teachers (2015 £s)</td>
<td>2070 (339)</td>
<td>3066 (524)</td>
</tr>
<tr>
<td>total exp per pupil (2015 £s)</td>
<td>4278 (1158)</td>
<td>5338 (1752)</td>
</tr>
<tr>
<td>exp ratio on teachers</td>
<td>0.49 (0.06)</td>
<td>0.54 (0.06)</td>
</tr>
<tr>
<td>% budget balance</td>
<td>0.8 (4.0)</td>
<td>1.5 (3.6)</td>
</tr>
</tbody>
</table>

Note: Schools that are LA maintained in 2012 but may have academised afterwards. Standard deviations in parentheses where applicable.
Other Datasets

- Consistent Financial Reporting (CFR)/Annual Accounts Returns (AAR): annual budget of state-funded schools (disaggregated to income/expenditure categories)
- STRB pay documents, union pay documents
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Empirical Strategy – Part I: The Effect of the Pay Reforms

1. Construct counterfactual pay, i.e. pay if reform had not happened
   1.1 estimate pre-reform pay progression through the M payscale:

   \[ \Delta_{\text{spine}}_{it} = \alpha_{d,l} + u_{s,l} + \epsilon_{i,t} \]

   ▶ \( \alpha_{d,l} \) is district-lagged spine point fixed effects
   ▶ \( u_{s,l} \) is school-lagged spine point random effects
   ▶ \( \epsilon_{i,t} \) is idiosyncratic error

   → 3 comments

1.2 take BLUP of \( \Delta_{\text{spine}}_{s,l} \) to account for small schools
1.3 using these estimates and one baseline spine point for each teacher, predict each teacher’s sequence of counterfactual spine points pre- and post-reform by extrapolation
1.4 merge in union-recommended pay schedule using counterfactual spine points

\[ \Rightarrow \] We now have both a “counterfactual” and an “observed” (full-time equivalent) base pay for every teacher.
Result 1: The effect of the pay reforms
In primary schools, pay drifted downwards by 1% on average relative to what would have happened in absence of the reform.
Result 1: The effect of the pay reforms
In secondary schools, pay drifted downwards by 2% on average relative to what would have happened in absence of the reform.

Standard errors clustered at the LA level. Observations at baseline years — mostly in 2010, when observed and counterfactual pay are mechanically the same — are excluded.
Result 1: The effect of the pay reforms
On average pay drifted downwards by 1-2% relative to what would have happened in absence of the reform

\[ \text{deviation}_{it} = (\log \text{ observed pay}_{it} - \log \text{ counterfactual pay}_{it}) \]
Empirical Strategy – Part I: Did schools flex their pay?
Towards a measure of the intensity of adoption

1. Construct counterfactual pay ✓

2. Construct a metric for the intensity of adoption
   2.1 We use the deviations of log observed pay from log counterfactual pay for each teacher, and
   2.2 aggregate these deviations to the school level using the RMSE of predicting log observed pay with log counterfactual pay
   ➔ More details

=> This RMSE measures the extent to which schools deviated on average from counterfactual pay schedule.
   ▶ RMSE = 0 for schools who continued with seniority pay (by following the union-recommended pay schedule)
   ▶ A higher RMSE means more departure (in either direction) from counterfactual, that is, a higher intensity to adopt pay flexibilities.
Result 2: Schools did use the freedom to flex their pay

Primary schools
Result 2: Schools did use the freedom to flex their pay
Secondary schools

RMSE of observed pay predicted by counterfactual pay
Phase 2 schools

Counterfactual pay: distr version.
Schools with at least 5 teachers per period. N0=1519, N1=1521
Vertical black solid line at 0 marks null hypothesis.
Result 2: Schools did use the freedom to flex their pay
Modified RMSE as a metric of adoption intensity

- RMSE tells us about the degree of deviation from counterfactual pay – BUT not the direction!
- However, paying more than the counterfactual vs. letting pay drifting downwards may have very different effects that RMSE alone would not reveal.

=> Modify RMSE by interacting it with the direction of deviation:

1. positive deviation: the school on average paid higher wages than the counterfactual
2. negative deviation: the school on average paid higher wages than the counterfactual

(→ Distribution of school-level mean deviations)

=> 2 measures of adoption intensity

1. intensity of positive adoption = \( I \) (mean deviation \( \geq 0 \)) \( \times \) RMSE
2. intensity of negative adoption = \( I \) (mean deviation \( < 0 \)) \( \times \) RMSE
Results – Adopter types and their intensity to adopt

More negative adopters, with about the same adoption intensity

<table>
<thead>
<tr>
<th></th>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive adopter</td>
<td>7,450 (2,790)</td>
<td>561 (428)</td>
</tr>
<tr>
<td>Negative adopter</td>
<td>8,160 (3,541)</td>
<td>1,100 (1,006)</td>
</tr>
</tbody>
</table>

Note: Number of schools with at least 5 teachers in 2011-2012 and 2014-16 in parentheses.
Results – What predicts the intensity of adoption?
A simple variable selection exercise

- Primary schools
  - pre-reform observed school characteristics explain 1-3% of the variation in adoption intensity
  - LA effects explain about 10%

- Secondary schools
  - pre-reform observed school characteristics explain 6-12% of the variation in adoption intensity:
    - religious character
    - higher male teacher share
    - higher qualified teacher share
    - lower white British teacher share
    - more academies within 3km
    - higher pay at closest academy
  - are associated with higher (lower) intensity of positive (negative) adoption
  - LA effects explain about 20%
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Empirical Strategy – Part II: Implications

A Difference-in-Differences style approach (non causal!)

- In a DiD-style framework comparing high vs. low intensity adopters, we now explore the implication of the reform’s pay impact:

\[ y_{st} = \alpha_s + \sum_{\tau \neq 2012} \beta_\tau + \sum_{\tau \neq 2012} \gamma_\tau \times PAI_{s}^{post} \]

\[ + \sum_{\tau \neq 2012} \delta_\tau \times NAI_{s}^{post} + \sum_{\tau \neq 2012} X'_s \psi_\tau + \epsilon_{st}, \]

where

- \( y_{st} \) is outcome of school \( s \) in year \( t \) (wage premium, retention rate, etc. – see later)
- \( PAI_{s}^{post} \) and \( NAI_{s}^{post} \) are the positive and negative adoption intensity measures post-reform
- \( \sum_{\tau \neq 2012} X'_s \psi_\tau = \sum_{\tau \neq 2012} \lambda_\tau \times PAI_{s}^{pre} + \sum_{\tau \neq 2012} \mu_\tau \times NAI_{s}^{pre} \) to control for potential time-varying effects of pre-reform pay deviation at the school
- Coefficients of interest: \( \gamma_\tau \)'s and \( \delta_\tau \)'s (reference year: 2012)
- SEs clustered at the LA level

▶ Coefficients of interest: \( \gamma_\tau \)'s and \( \delta_\tau \)'s (reference year: 2012)
▶ SEs clustered at the LA level
Results – Wage premium

\[ \text{wage premium}_{st} = \alpha_s + \sum_{\tau \neq 2012} \beta_{\tau} + \sum_{\tau \neq 2012} \gamma_{\tau} \times PAI_{s}^{post} \]

\[ + \sum_{\tau \neq 2012} \delta_{\tau} \times NAI_{s}^{post} + \sum_{\tau \neq 2012} X_s' \psi_{\tau} + \epsilon_{st}, \]

where wage premium is the school-level mean residual of FTE base pay from the teacher-level regression on gender, ethnicity, cubic age, qualification status and region x year x payscale effects.
Results – Retention

\[ \text{retention rate}_{st} = \alpha_s + \sum_{\tau \neq 2012} \beta_{\tau} + \sum_{\tau \neq 2012} \gamma_{\tau} \times \text{PAI}_{s}^{post} \]

\[ + \sum_{\tau \neq 2012} \delta_{\tau} \times \text{NAI}_{s}^{post} + \sum_{\tau \neq 2012} X_{s}^{'} \psi_{\tau} + \epsilon_{st}, \]

where retention rate is year \( t - 1 \) teachers remaining in the same school for year \( t \) divided by 2012 teacher number.
Results – Number of classroom teachers

FTE number of teachers \(_{st} = \alpha_s + \sum^{\tau \neq 2012}_{\beta_T} + \sum^{\tau \neq 2012}_{\gamma_T} \times PAI^p_{s} + \sum^{\tau \neq 2012}_{\delta_T} \times NAI^p_{s} + \sum^{\tau \neq 2012}_{X_s' \psi_T} + \epsilon_{st},\)
Results – Qualifications (quality)

\[
\text{frac with qualified status}_{st} = \alpha_s + \sum_{\tau \neq 2012} \beta_\tau + \sum_{\tau \neq 2012} \gamma_\tau \times PAI_{s}^{post} \\
+ \sum_{\tau \neq 2012} \delta_\tau \times NAI_{s}^{post} + \sum_{\tau \neq 2012} X_s' \psi_\tau + \epsilon_{st},
\]
Discussion – Teacher labour market structure
Labour supply elasticity to the schools

Following Manning (2003), we can recover the labour supply elasticity to individual schools, a measure of labour market concentration. By back-of-the-envelope calculation using the estimates for negative adopters:

\[ \hat{\epsilon}_{ssls} = -2 \frac{\hat{\delta}_{DID} \text{retention/s}e\text{paration rate}}{\hat{\delta}_{\log \text{pay}}} \approx \begin{cases} -2 \frac{-0.001}{0.2} \frac{0.002}{0.002} = 5 & \text{for primary schools} \\ -2 \frac{-0.003}{0.15} \frac{0.002}{0.002} = 20 & \text{for secondary schools} \end{cases} \]

Due to noisily estimated point estimates, levels can vary within a wide range, but

labour market for secondary school teachers is certainly more competitive than that of primary school teachers.
Next Steps

1. Explore the role of local teacher labour markets
   1.1 construct a measure of local teacher labour market competition and explore the heterogenous effects of the pay decentralisation reform (e.g. Azar et al. 2019)
   1.2 effects of LA pay policy recommendations (collected through FOIs, being processed)

2. Effect on other outcomes (additional pay components, pay for different groups of teacher, promotion rates, sorting across schools, pupil outcomes, budget items)
Conclusion

As a result of the 2013-14 teacher pay decentralisation in England, pay declined by 1-2% overall relative to what would have happened in absence of the reform.

▶ Vast majority of schools departed from the seniority pay schedule
  ▶ more than half let their pay drift down relative to counterfactual

▶ Schools that let their pay drift downwards by more, experienced:
  ▶ a higher pay cut
  ▶ a drop in their retention rate
  ▶ a decline in the fraction of qualified teachers

=> The policy backfired. Punchline: “Advisory” spine points were reinstated in 2020.
Institutional background

Number of schools in England over time, by funding type

Source: DfE School Census 2018
Institutional background

Number of FTE pupils in England over time, by funding type

Source: DfE School Census 2018

(→ Back)
Institutional background

Number of FTE teachers in England over time, by funding type

FTE Number teachers in England (in thousands)

Source: DfE SWF 2017
Institutional background

Share of LA maintained schools in England over time

Share of LA maintained schools in England

Source: Own calculations from SWF

(→ Back)
Institutional background
Share of LA maintained school teachers in England over time

Share of FTE teachers in LA maintained schools in England

Source: Own calculations from SWF

(→ Back)
Data Issues in SWF

1. Teacher records aggregated to main job per year
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
   => Newer version includes unrounded 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
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
Data Issues in SWF

1. Teacher records aggregated to main job per year
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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 intensity adoption

(→ Back)
Estimating counterfactual spine progression – 3 comments

1. Spine progression pre-reform should have been fully automatic. However, it was not and there were large heterogeneities across LAs and schools in this.
1. Spine progression pre-reform should have been fully automatic. However, it was not and there were large heterogeneities across LAs and schools in this.

2. It is important to account for such pre-reform school-level heterogeneities, otherwise we overpredict counterfactual spine points and so counterfactual pay. This leads to estimating a larger pay impact of the reforms.

3. Once we account for pre-reform school-level heterogeneities, no observed teacher characteristics further explain variation in pre-reform spine progression.
RMSE as a metric of adoption intensity

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 log observed pay when predicted by log counterfactual pay in every school for the post-reform period (2014-16):

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

- RMSE = 0 for schools who continued with seniority pay (by following the union-recommended pay schedule)
- RMSE is undirected, ie. does not tell if schools paid more or less, only that they paid differently from the seniority pay schedule

(→ Back)
Distribution of school-level mean deviation

\[
\text{mean deviation}_s = \frac{\sum_{i,t \text{ s.t. } t \in \{2014,2015,2016\}} (\log \text{ observed pay}_{it} - \log \text{ counterfactual pay}_{it})}{n_s}
\]