# Workforce Wage Gap in Space, Labour Market Transformations and Structural Inequality

Concetta Gigante
University of Liverpool

**UK Data Service Labour Force and Annual Population Surveys User Conference 2025**

June 19, 2025

# Motivation

- In the UK, the gender wage gap decreased by a quarter to $13.1\%$ in April 2024
- Occupation of skilled trades accounted for $24\%$ of wage discrepancies in $2024$, by contrast the gender wage gap in professional occupations increased over time stabilising to $17\%$ in $2024$.
- High within occupations wage gap calls for further investigations of policy implementations

# Motivation

- In the UK, the gender wage gap decreased by a quarter to $13.1\%$ in April 2024
- Occupation of skilled trades accounted for $24\%$ of wage discrepancies in $2024$, by contrast the gender wage gap in professional occupations increased over time stabilising to $17\%$ in $2024$.
- High within occupations wage gap calls for further investigations of policy implementations
- Gender Wage Gap Reporting Policy enshrined in Equality Act $2010$, all organisations with $\geq 250$ employees mandatory annual publication of reports on the gender wage gap

# Motivation

- **Questions**:

**1**. How do within space structural variations affect wage inequality and the gender wage gap?

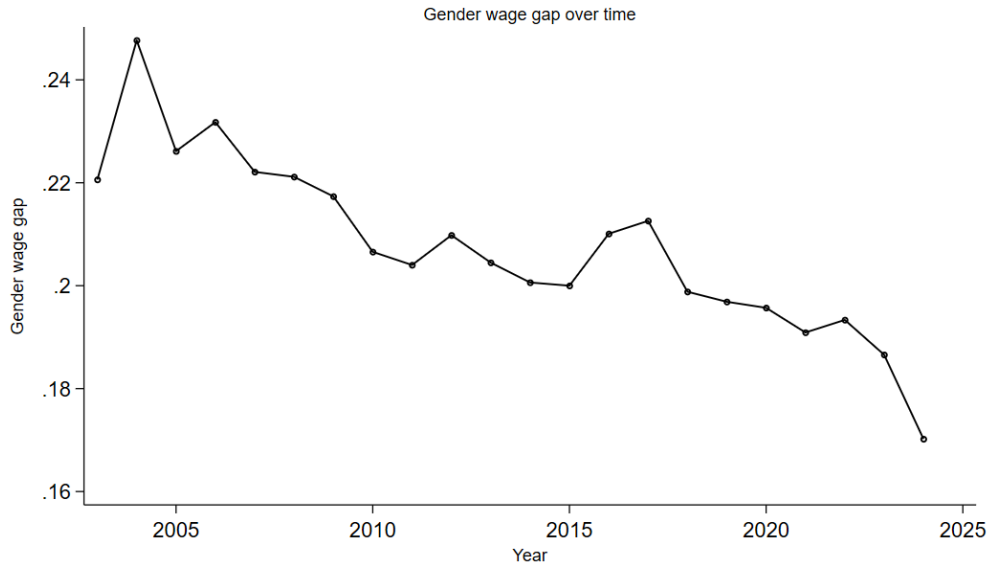
**2**. What is the effect of the Gender Wage Gap Reporting policy in the UK on the gender wage gap?

# Data

UK Quarterly Labour Force Survey (QLFS) over the period $2003$q3 to $2024$q4, nationally representative UK individual households

- Approx. $4$ million obs, sample restricted to individuals in age group $25$-$64$ and keep respondents in wave $1$ and $5$ only
- Final sample $1,031,017$ individual respondents of which $574,429$ are female and $456,588$ are male
- Average wage for female in the sample is $£12.7$ that is $25.61\%$ lower than the wage of male in the selected sample period
- $65.16\%$ of male workers in full time positions, only $33.57\%$ of female in this positions being in a full time job.

# Motivating Evidence




Gender wage gap over time

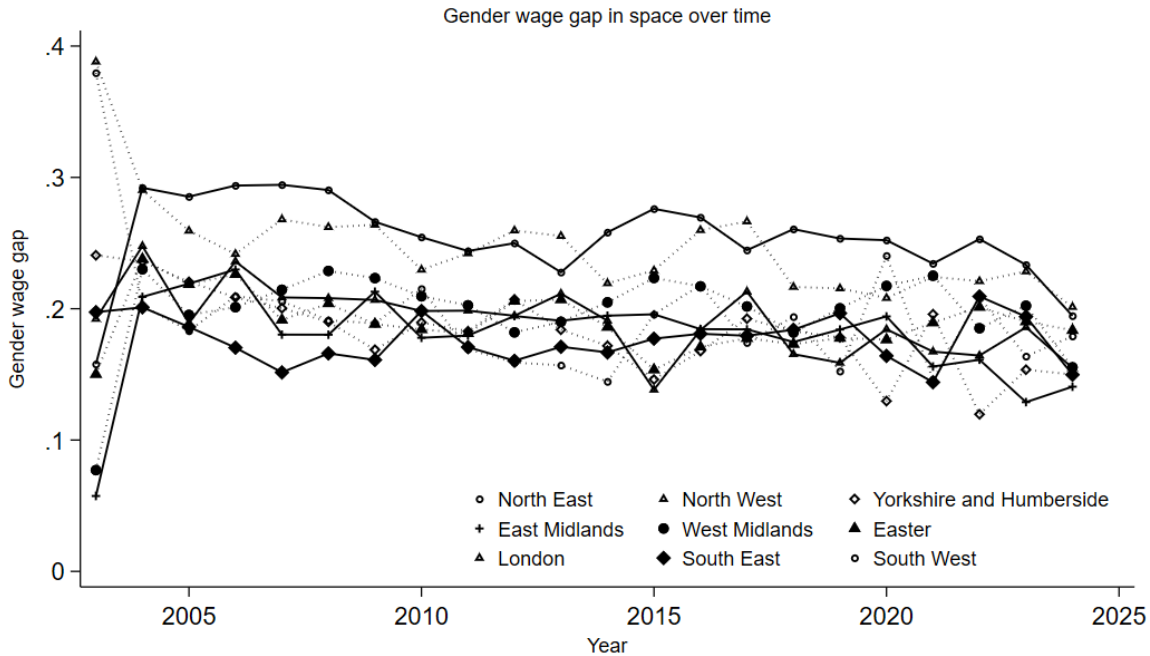
- Gender wage gap difference in average wage between male and female as a proportion of male workers' wage, across all jobs and not within occupations or industry sectors.
- Decline of $8\%$ of the gender wage gap since $2004$, with current figure $17\%$ requiring further policy examination

# Gender Wage Gap in Space

| | Mean | Std | Skewness | Kurtosis |
|---|---|---|---|---|
| North East England | 0.194 | 0.051 | 2.546 | 10.707 |
| North West England | 0.191 | 0.026 | 0.107 | 2.896 |
| Yorkshire and Humberside | **0.112** | 0.035 | -1.187 | 7.092 |
| East Midlands | 0.177 | 0.036 | -1.777 | 9.829 |
| West Midlands | 0.198 | 0.033 | -2.456 | 3.037 |
| Easter | 0.191 | 0.021 | 0.352 | 8.578 |
| London | **0.248** | 0.039 | 2.091 | 2.075 |
| South East England | 0.176 | 0.018 | 0.051 | 4.777 |
| South West England | **0.254** | 0.033 | -1.191 | 2.916 |
| Wales | **0.235** | 0.021 | 0.382 | 3.134 |
| Scotland | 0.165 | 0.047 | 0.601 | 2.690 |
| Northern Ireland | 0.182 | 0.031 | -0.108 | 5.859 |
| Total | 0.194 | 0.049 | -0.018 | 4.705 |

- South West has the highest gender wage gap (25.4%), followed by London (24.8%) and Wales (23.5%)
- Lowest gender wage gap Yorkshire and Humberside (11.2%), but negative skewness

# Motivating Evidence




Gender wage gap in space over time

- North East of England experienced a decay of the gender wage gap from $38\%$ in 2003 to approximately $18\%$ in 2024
- Gender wage gap of $38.81\%$ in 2003 present in London that by 2024 reached $20.13\%$
- Consistent decay across of geographical regions

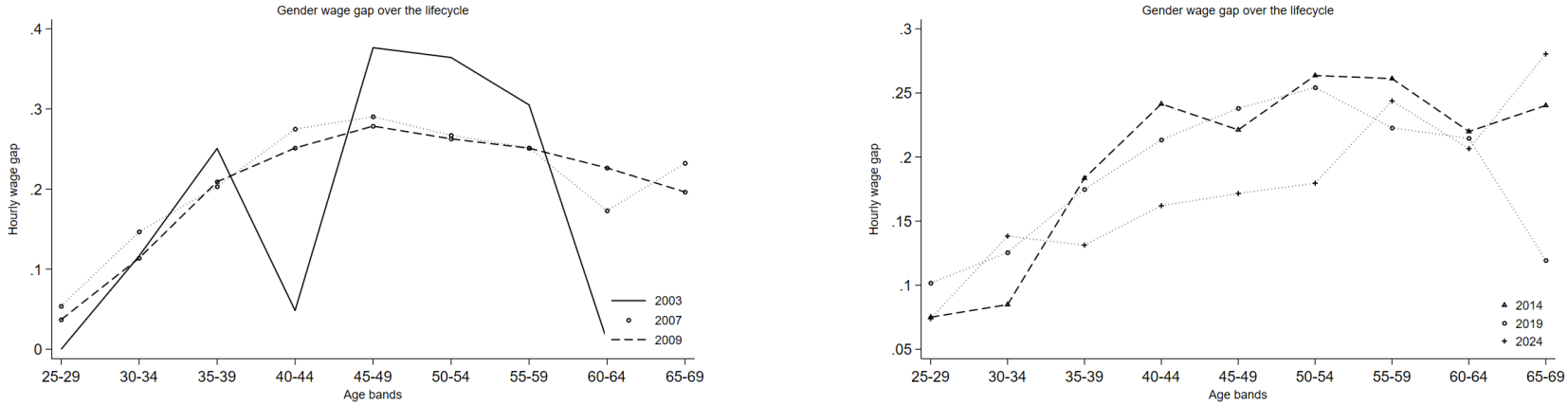
# Motivating Evidence

Structural wage inequality

| | 2003 | | 2014 | |
|---|---|---|---|---|
| | Female | Male | Female | Male |
| Within inequality | | 0.145 | | 0.154 |
| Between inequality | | 0.061 | | 0.056 |
| Gini coefficient | 0.277 | 0.291 | 0.297 | 0.317 |
| | 2024 | | All sample | |
| | Female | Male | Female | Male |
| Within inequality | | 0.139 | | 0.158 |
| Between inequality | | 0.047 | | 0.057 |
| Gini coefficient | 0.266 | 0.293 | 0.308 | 0.324 |

- Majority of wage inequality between female and male is within each group, resulting in $15.8\%$ of within wage inequality in all sample
- Apparent proportion of structural wage inequality between the two groups, but moderate

# Gender Wage Gap over the lifecyle




Gender wage gap 2003-2009, 2014-2024

- Increasing hump shaped pattern over the lifecycle
- Age band 45-49 records the highest gender wage gap in 2003 to 38% and in 2009 to 29%. In 2024 gender wage gap stays high at 17.15%

# Labour market transformation



Job type gender wage gap

- Gender wage gap in full time jobs significantly larger than part time jobs
- $14\%$ decline in gender wage gap full time jobs in $2024$, increasing trend of part time job gender wage gap reaching $9\%$ in $2024$
- Decline of $38.10\%$ and $41.18\%$ in gender wage gap for flexible and non flexible jobs, respectively

# This Paper

Study the Gender Wage Gap Reporting policy enacted into the Equality Act 2010 on wage and the gender wage gap

- How much of the decline in the gender wage gap is attributable to the implementation of the Gender Pay Gap regulation

# This Paper

Study the Gender Wage Gap Reporting policy enacted into the Equality Act 2010 on wage and the gender wage gap

- How much of the decline in the gender wage gap is attributable to the implementation of the Gender Pay Gap regulation
- Examine effectiveness of this policy on the gender wage gap across spatial UK regions through a synthetic control method estimator

# Contribution to the Literature

**Gender wage gap literature**

Becker (1975), Card and Krueger (1992), Goldin (1994), Goldin (2006), Juhn and Murphy (1997), Blau and Kahn (2006), McGrattan and Rogerson (2008), Autor et al. (2008), Blau and Kahn (2013), Goldin (2014), Bick et al. (2022), Mas and Pallais (2017), Cubas et al. (2023), Li and He (2022), Card et al. (2016), Erosa et al. (2022), Lindenlaub and Prummer (2021)

**Synthetic control method literature**

Abadie and Gardeazabal (2003), Abadie et al. (2010), (Abadie, 2021), Abadie and L'Hour, (2021)

**This Paper**

Causal estimates on the gender wage gap in the UK drawing on geographical differences of the gender wage gap across British regions through a synthetic control method estimation.

# Econometric Specification

## Synthetic control method estimator

- Focus on the South West of England as the region with largest gender wage gap
- Weighted average of untreated units

$$\hat{Y}_{1t}^{0} = \sum_{2}^{J+1} w_j Y_{jt}, \quad \forall t \geq T_0, \tag{1}$$

with $w_j \geq 0$ and $\sum_{2}^{J+1} w_j = 1$, $Y_{jt}$ outcome unit $j$ not exposed to the treatment/policy

- ATT $= \eta_{1t} = Y_{1t}^{1} - Y_{1t}^{0}$
- Main step: minimisation problem $\min_W ||X - X_0 W||$
  $X$ matrix of regressors treated units, $X_0$ matrix of regressors untreated units, $||\cdot||$ is the distance norm, delivers synthetic control estimator

# Econometric Specification

## Synthetic control method

$$Y_{jt}^{0} = \delta_t + \theta_t Z_j + \lambda_t \mu_j + \epsilon_{jt}, \tag{2}$$

- $\delta_t$ time trend, $\theta_t$ and $\lambda_t$ vector of coefficients observed and unobserved units
- $Z_j$ vector of covariates, $\mu_j$ factor loading, $\epsilon_{jt}$ error term

$$\sum_{2}^{J+1} w_j Y_{jt} = \delta_t + \theta_t \sum_{2}^{J+1} w_j Z_j + \lambda_t \sum_{2}^{J+1} w_j \mu_j + \sum_{2}^{J+1} w_j \epsilon_{jt}, \tag{3}$$

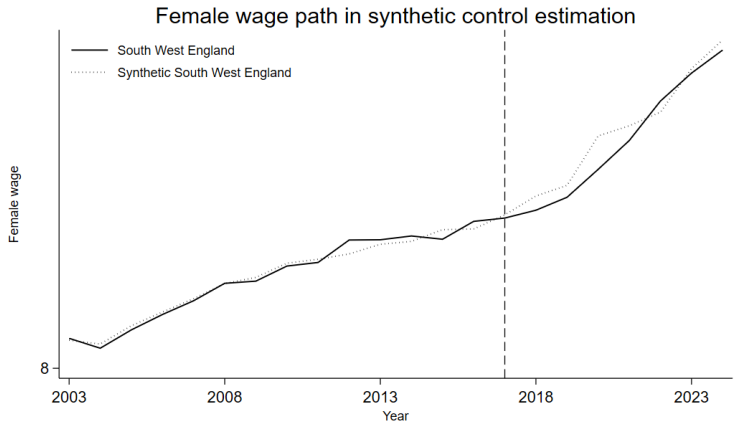
Synthetic control estimator

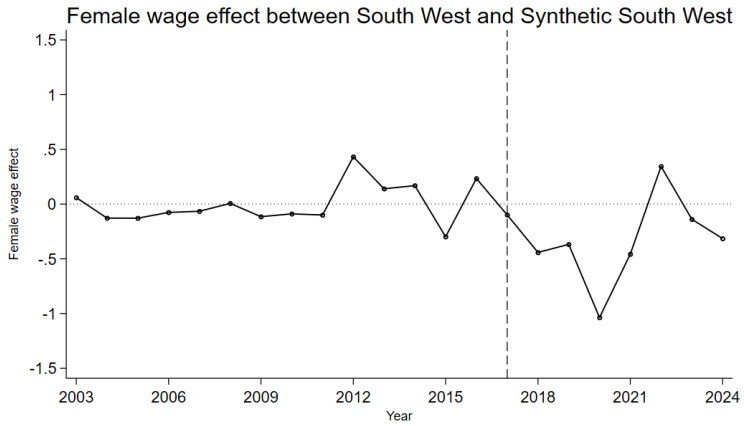
$$\hat{\eta}_{1t} = Y_{1t} - \sum_{2}^{J+1} \hat{w}_j Y_{jt}, \quad \forall t = T_0 + 1, ..., T. \tag{4}$$

# Identification

- No anticipation effect
- Stable units treatment value assumption
- Choice of the comparison group: use pre intervention patterns using data before the intervention, consider regions that had a delayed implementation of the policy into the donor pool like Northern Ireland with policy enforced in $2027$ and implemented starting $2028$

# Estimated results




Female wage path synthetic control estimation

- Female wage of treatment group in the pre intervention period $2003$-$2017$ perfectly reproduced
- Approximation for the South West of England for the period $2017$-$2024$ in the absence of the intervention
- Decay female wage, increases by less than $0.5\%$

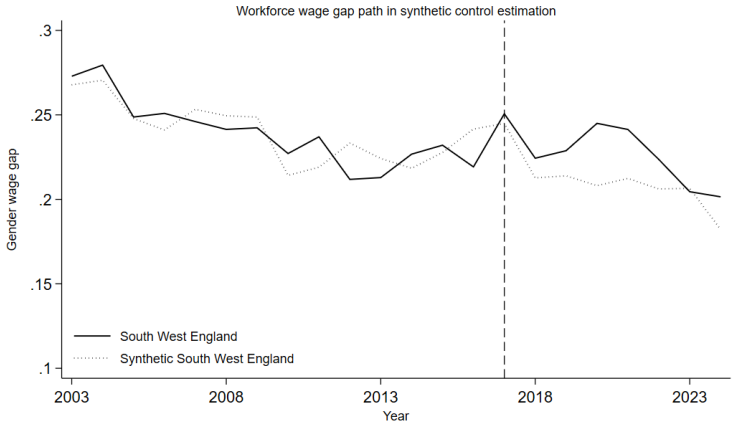
# Estimated results

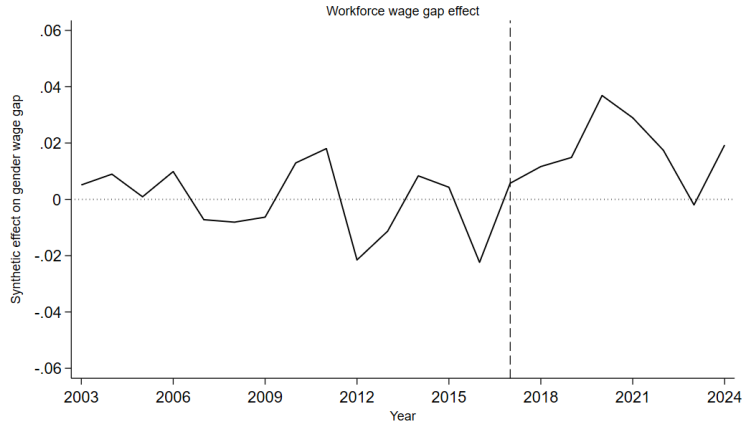
## Synthetic South West

| Region | Weight |
|---|---|
| North East | 0.000 |
| North West | 0.000 |
| Yorkshire and Humberside | **0.062** |
| East Midlands | **0.130** |
| West Midlands | 0.000 |
| Eastern | **0.487** |
| London | 0.000 |
| South East | **0.209** |
| Wales | **0.113** |
| Scotland | 0.000 |
| Northern Ireland | 0.000 |

- Synthetic control made of Eastern, South East, Wales, East Midlands, Yorkshire and Humberside

# Estimated results

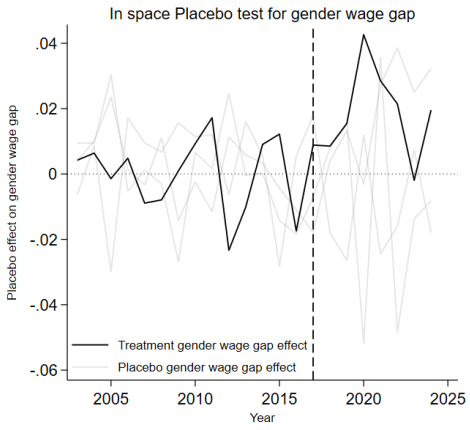


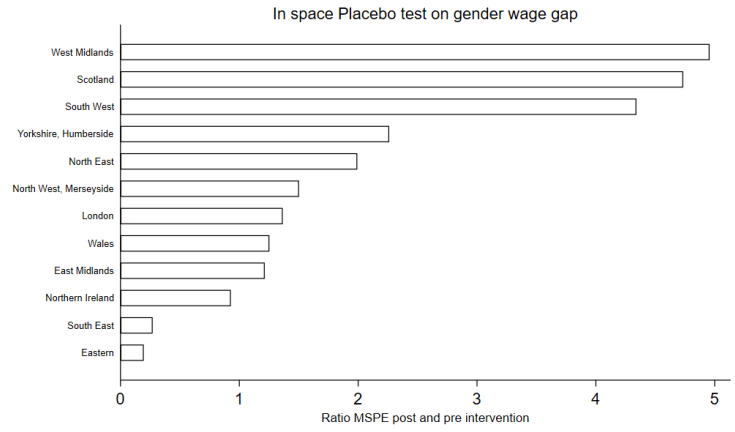




Gender wage synthetic control estimation

- Path of the gender wage gap prior to the passage of the Gender Wage Gap Reporting reasonably well
- Approximation of the gender wage gap in the South West prior to the intervention
- Treated units experienced a $2.43\%$ rise in the gender wage gap post intervention

# Placebo tests




Gender wage in space placebo tests

- Placebo treated unit is different from the effect of the South West
- Large MSPE ratio for the actual treated region South West $4.341$

# Conclusion

- Examined geographical variations in gender wage gap and causal impact of the Gender Wage Gap Reporting policy
- Used causal variations of regions in pre intervention period with policy implementation delays
- Policy rises gender wage gap in the three years after implementation before reducing it. Causal impact effect of $2.32\%$ on the gender wage gap, structural inequality