



The Impact of High-Pay Sector Employment and Workforce Structure on Regional Median Earnings in the UK

LCDB7011 –Quantitative Research Methods

DBA

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Abstract

Regional wage disparities remain a persistent and defining feature of the United Kingdom's labour market, raising critical questions about the underlying structural drivers of earnings inequality across regions. Despite successive policy initiatives aimed at “levelling up,” the wage gap between London and the South East and many other UK regions has remained substantial, suggesting that deeper economic and institutional dynamics are at play. This study seeks to address these questions by examining the impact of high-pay sector employment and workforce composition on median regional earnings at the NUTS1 level.

The analysis draws on the Office for National Statistics (ONS) Earnings and Employment from Pay As You Earn Real Time Information (PAYE RTI) dataset for April 2024. Particular attention is given to the proportion of employment in two consistently high-paying industries: Information and Communication, and Finance & Insurance. These sectors are widely recognised as generators of wage premia, reflecting both their knowledge intensity and their concentration in metropolitan regions. Alongside this sectoral focus, the study also explores the structure of the regional workforce, with emphasis on the share of employment in professional, scientific, and technical occupations. Regional employment totals are included as a control to capture the effects of labour market scale.

A range of quantitative techniques is applied, including reliability analysis using Cronbach's Alpha for composite sectoral measures, descriptive statistics to capture regional variation, correlation analysis to identify associations, and multiple regression analysis to estimate the relative contributions of industrial and occupational factors. Results demonstrate that regions with a higher concentration of employment in high-paying sectors consistently achieve higher levels of median pay. Professional and technical employment shares are also positively associated with wages; however, their strong collinearity with high-pay sector shares complicates causal inference and raises questions about independent effects.

The findings highlight industrial structure as a central driver of regional wage inequality, reinforcing debates on segmentation. Policy should foster diversification into high-value sectors and expand professional skill investment. Yet, cross-sectional design and missing age data limit conclusions, underscoring the need for longitudinal, granular future research.

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Abbreviation

Office for National Statistics (ONS)

Pay As You Earn Real Time Information (PAYE RTI)

Nomenclature of Units for Territorial Statistics (NUTS)

Information and Communication Technologies (ICT)

Variance Inflation Factors (VIFs)

Organisation for Economic Co-operation and Development (OECD)

Professional, Scientific, and Technical (Prof-Tech)

HM Revenue and Customs (HMRC)

Labour Force Survey (LFS).

1. Introduction

Background and Motivation

Wage inequality between UK regions has long been a subject of academic and policy concern. Despite decades of economic restructuring, regional divides in pay and employment opportunities remain entrenched, particularly between London and the South East and other parts of the country. These disparities not only reflect historical differences in industrial base and economic geography but also raise questions about the equitable distribution of opportunities across the UK, with implications for social cohesion and regional development policy. The government's "levelling up" agenda further underscores the urgency of understanding the structural drivers of regional wage variation (Audretsch, D., & Feldman, M., 1996).

Existing studies highlight two broad categories of determinants of regional earnings: industrial composition and workforce characteristics. On the one hand, the concentration of high-value sectors such as financial services, information and communication technologies (ICT), and professional business services has been strongly associated with higher wage levels (Leppälä, S., 2018). These industries not only generate higher value added per worker but also exhibit wage premiums linked to skill intensity, productivity, and global integration. On the other hand, the demographic and occupational structure of the workforce also plays a critical role. Regions with a greater share of prime-age workers (typically 30–49 years) and higher proportions of professionals and technical employees tend to achieve higher median wages, reflecting human capital advantages and occupational wage differentials (Jaffe, A. B., et al., 1993).

Research Problem

While there is a rich body of literature on regional pay gaps in the UK, less attention has been paid to the combined role of high-pay sector employment and workforce composition in shaping earnings at the regional level (Steijn, M. P. A. et al., 2022). Much of the evidence either focuses narrowly on industrial composition or on demographic characteristics, but relatively few studies integrate these perspectives using recent, high-frequency administrative data. The availability of PAYE RTI data from the ONS offers a unique opportunity to analyse regional earnings dynamics with contemporary evidence, overcoming some of the limitations of survey-based approaches.

Research Aim and Objectives

The central aim of this thesis is to investigate the impact of high-pay sector employment and workforce structure on regional median earnings in the UK. To achieve this, the study sets out the following objectives:

1. To construct reliable composite indicators of high-pay sector employment shares using Information & Communication and Finance & Insurance data.
2. To describe regional variation in median pay, sectoral employment structure, and total employment.
3. To estimate the strength and direction of associations between high-pay sector shares, workforce structure (professional/technical employment), and regional earnings.
4. To assess the independent effect of high-pay sector employment on regional median pay when controlling for workforce composition and labour market size.

Research Questions

This thesis addresses the following research questions:

1. Do regions with larger shares of employment in high-pay sectors exhibit higher median earnings?
2. How does workforce structure, particularly professional and technical employment shares, relate to regional pay outcomes?
3. Does workforce structure mediate the impact of high-pay sector employment on regional earnings?
4. What is the relative importance of industrial composition compared to workforce size in explaining pay disparities?

Hypotheses

Based on theory and prior empirical findings, the study tests the following hypotheses:

- H1: Regions with a higher share of employment in high-pay sectors (ICT, Finance & Insurance) have significantly higher median pay.
- H2: Regions with a larger share of professional and technical employees have higher median pay.
- H3: After controlling for workforce size, the positive association between high-pay sector share and median pay remains significant.

Structure of the Thesis

The remainder of the thesis is organised as follows. Chapter 2 reviews the literature on wage inequality, industrial composition, and workforce structure in the UK and beyond. Chapter 3 outlines the dataset and methodology, including the operationalisation of variables and the quantitative techniques employed. Chapter 4 presents the empirical results, including descriptive statistics, correlation analysis, regression models, and mediation analysis. Chapter 5 discusses the implications of the findings in light of existing literature and policy debates. Chapter 6 concludes by summarising the contributions, highlighting limitations, and proposing directions for future research.

2. Literature Review

2.1 Introduction

The literature on regional wage disparities is vast, intersecting theories of labour economics, regional development, and industrial organisation. At its core, the question of why wages differ across places is rooted in structural variations in industrial composition, human capital, and demographic characteristics of the workforce (Nelson, R., 1959). This chapter reviews the theoretical and empirical contributions that inform the present study, focusing on (a) wage determination theories, (b) the role of industrial composition particularly high-pay sectors in shaping earnings, (c) the influence of workforce structure and demographics, and (d) empirical evidence on the United Kingdom and comparative international contexts. The review concludes by identifying the research gap addressed by this thesis.

2.2 Theoretical Foundations of Wage Inequality

2.2.1 Human Capital Theory

The human capital framework, originally advanced by Becker (1964), provides a powerful lens for understanding wage determination and regional economic performance. At its core, the theory suggests that wages are not set arbitrarily but rather reflect the underlying productivity of workers. Productivity, in turn, is shaped by the accumulation of knowledge and skills, which are developed through deliberate investments in education, formal training, and on-the-job experience. Individuals who invest more heavily in their own human capital tend to command higher wages, as they bring greater efficiency and value to employers. From a regional perspective, this implies that areas with a more highly educated and better-trained workforce should, on average, enjoy higher wage levels and potentially more robust economic growth (O’Leary, N. et al., 2005).

Beyond education and training, extensions of the framework highlight the significance of demographic factors, particularly the age composition of the workforce. Age is closely related to experience, career stage, and productivity. Workers in the mid-career stage, typically between 30 and 49 years old, are often considered to be at or near the peak of their earnings trajectory. This stage reflects a combination of accumulated experience, refined skills, and professional maturity, which enhance both individual productivity and overall economic output. In contrast, younger workers may still be developing foundational skills, while older workers may face declining productivity or reduced attachment to the labor force(Porter, M. ,2003).

Therefore, workforce demographics are not merely descriptive statistics about who participates in the labor market; they are integral determinants of productivity, wage outcomes, and regional competitiveness. A region's wage profile is thus shaped by both the stock of human capital in terms of education and training, and the dynamic age structure of its workforce. Understanding these interactions provides valuable insights for policymakers concerned with regional development, inequality, and long-term growth(Robson, M. ,2009).

2.2.2 Structuralist and Segmentation Approaches

Critiques of human capital theory highlight important limitations in the assumption that wages are determined solely by individual productivity. While investments in education, training, and experience undeniably influence earnings, scholars have argued that institutional, structural, and sectoral dynamics also play a critical role. In particular, labour market segmentation theory, developed by Doeringer and Piore (1971), provides a framework for understanding why workers with similar qualifications may experience very different wage outcomes depending on the segment of the labour market in which they are employed.

Segmentation theory distinguishes between the primary and secondary sectors of the labour market. The primary sector is typically characterised by relatively high wages, stable employment, opportunities for career progression, and stronger protections for workers. In contrast, the secondary sector is marked by low pay, precarious employment, limited training opportunities, and little prospect for upward mobility. Importantly, movement between these sectors is often constrained, meaning that workers in secondary employment face structural barriers to accessing the more secure and better-paid positions of the primary sector. This division complicates the neat predictions of human capital theory, suggesting that structural inequalities can limit the returns to education and training (Shearmur , R & Polese , M ., 2005).

At the regional level, segmentation theory underscores the significance of industrial composition in shaping wage outcomes. Regions with a higher concentration of employment in primary sectors such as finance, information and communications technology (ICT), or advanced manufacturing tend to command higher average wage levels. Conversely, regions dominated by secondary-sector industries, including retail, hospitality, and certain forms of manual labour, often exhibit lower wages and less stable employment. Thus, wage disparities across regions cannot be explained solely by differences in worker skills or qualifications but must also be understood in relation to the broader economic and institutional structures that shape labour markets.

2.2.3 Regional Development Theories

New economic geography (Krugman, 1991) and earlier agglomeration theories (Marshall, 1890) provide further insight into the persistence of regional disparities by drawing attention to spatial externalities and the benefits of economic concentration. Unlike human capital or segmentation theories, which focus on individual or sectoral characteristics, these approaches emphasise the role of location and the cumulative advantages that arise when firms and workers cluster together in particular regions.

According to Marshall, industrial agglomeration generates productivity advantages through three key mechanisms. First, knowledge spillovers occur as firms and workers benefit from close proximity, enabling the rapid exchange of ideas and innovations. Second, labour market pooling ensures that both employers and employees gain from a larger, more specialised pool of skills, which reduces hiring costs and facilitates better matches between workers and jobs. Third, dense supplier and customer networks reduce transaction costs, strengthen supply chains, and create economies of scale. Together, these factors increase productivity and, by extension, generate wage premiums for workers located within agglomerated industries.

Krugman's new economic geography extended these ideas by formalising how centripetal forces—such as market size and accessibility—draw firms and workers into metropolitan hubs, while peripheral regions risk being left behind. The clustering of high-value sectors, including finance, professional services, and information technology, is therefore not accidental but reflects self-reinforcing dynamics where initial advantages accumulate over time.

In the UK, these dynamics are especially visible in London and the South East, which host a disproportionate share of high-pay, knowledge-intensive service industries. The concentration of these activities not only raises regional wage levels but also widens the gap with other parts of

the country where such industries are sparse. Consequently, spatial agglomeration contributes significantly to the geography of inequality in wages and opportunities.

2.3 Industrial Composition and Wage Outcomes

2.3.1 High-Pay Sectors: Finance, ICT, and Professional Services

A substantial body of research highlights the disproportionate influence of high-pay sectors on regional wages. Financial services and ICT industries generate higher value added per employee and, consequently, offer higher average wages than traditional manufacturing or low-skill services (ONS, 2023; OECD, 2022). Studies by Faggio and Overman (2014) show that wage inequality across UK regions widened alongside the expansion of financial services, which are heavily concentrated in London. ICT has also been associated with both higher pay and higher productivity due to skill complementarities and technological intensity.

2.3.2 Sectoral Specialisation and Regional Pay

Empirical studies suggest that industrial specialisation explains a significant proportion of regional wage variation. For example, Morris and Stokes (2015) find that regions specialised in high-value-added sectors exhibit wage premiums even after controlling for education levels. However, excessive specialisation can also expose regions to volatility, as seen in the North East during the decline of heavy industry. Thus, industrial composition interacts with broader labour market resilience.

2.3.3 Composite Indicators of High-Pay Employment

Researchers often construct composite measures of “high-pay employment shares” by aggregating sectors such as finance, ICT, and professional business services (Moretti, 2013). These indices are used to capture structural differences that single-sector indicators may miss. The construction of a reliable composite indicator (tested via Cronbach’s Alpha or factor analysis) is therefore consistent with existing practice in the field.

2.4 Workforce Structure and Demographics

2.4.1 Age Structure and Earnings Profiles

Age is a well-established determinant of individual earnings, reflecting the lifecycle of human capital accumulation. Mincerian wage equations typically include experience as a quadratic term, predicting rising wages until mid-career and decline thereafter. Regions with a greater proportion of prime-age workers (30–49 years) are thus expected to show higher median wages (Bell &

Blanchflower, 2011). The demographic profile of the workforce has been linked to both productivity and labour supply considerations.

2.4.2 Occupational Composition

The occupational structure, particularly the share of professional, scientific, and technical workers, is another determinant of regional pay. These occupations command wage premiums due to higher skill requirements and association with knowledge-intensive sectors (Goos & Manning, 2007). Occupational upgrading—where low-skill jobs are replaced by mid- and high-skill roles—has been documented as a driver of wage growth in metropolitan regions.

2.4.3 Labour Market Participation and Flows

Beyond static structure, dynamic elements such as employment flows and labour mobility also affect regional wage levels. Areas with high inflows of skilled workers often experience wage premiums, while high outflows may depress local earnings (Champion & Shuttleworth, 2016). The PAYE RTI dataset's provision of employee flows offers a valuable, albeit underutilised, measure of such dynamics.

2.5 Empirical Evidence on Regional Earnings in the UK

2.5.1 Historical Patterns of Regional Inequality

Studies show persistent wage gaps between London/South East and other regions since the 1980s (Crafts, 2005). While deindustrialisation eroded high-paying manufacturing jobs in the North and Midlands, the expansion of finance and business services in London created new sources of inequality. Attempts to rebalance the economy through regional policy have had mixed results.

2.5.2 Recent Trends Using Administrative Data

The advent of PAYE RTI data provides higher-frequency, more granular insights into earnings. ONS (2023) reports that median pay growth is strongest in regions with concentrations of ICT and finance, reaffirming the structural interpretation. However, administrative data has limitations, including limited demographic breakdowns compared to Labour Force Survey microdata.

2.5.3 Sectoral and Occupational Drivers

Empirical models consistently find strong associations between sectoral composition and wages. For instance, Harris and Moffat (2015) demonstrate that the presence of knowledge-intensive business services significantly explains wage differentials across cities. Similarly, McCann

(2016) highlights that occupational upgrading in urban regions is linked to wage resilience post-2008 crisis.

2.6 International Evidence and Comparative Studies

Comparative evidence across OECD countries indicates that regional wage disparities are by no means unique to the UK but instead form part of a broader international pattern. According to OECD (2020), such disparities tend to be especially pronounced in economies with a high degree of sectoral concentration in financial services, ICT, and other knowledge-intensive industries. In these contexts, regions that successfully attract and sustain high-value sectors experience significant wage premiums, while areas lacking such industries risk being left behind, thereby widening internal wage gaps. By contrast, Southern European countries, where employment in high-pay sectors is comparatively limited, display narrower regional disparities in wage levels. However, this comes at the cost of generally lower national wage averages, reflecting the absence of strong productivity-driven wage growth in these economies. Taken together, this comparative perspective suggests that the expansion of high-pay sectors simultaneously raises overall wage levels while amplifying regional inequalities.

2.7 Methodological Approaches in the Literature

Most empirical studies in this field employ regression-based methods to estimate the relative impact of industrial and workforce composition on regional wage outcomes. Traditional cross-sectional regressions are frequently used in single-year analyses, providing a snapshot of associations between sectoral structure, occupational profiles, and average wages. Where panel data is available, fixed-effects models are typically preferred, as they allow researchers to control for unobserved heterogeneity across regions and to capture changes over time, thereby providing stronger evidence of causal dynamics.

Mediation analysis is less common within this literature but offers a valuable extension to conventional regression techniques. By explicitly testing whether occupational composition mediates the relationship between industrial structure and wages, mediation approaches enable researchers to disentangle direct and indirect effects, thus providing deeper insights into underlying mechanisms. Although not widely applied in regional economics, this method has potential to refine understanding of the pathways through which structural features shape labour market outcomes.

Reliability testing of composite indicators, while long established in psychology and the social sciences, remains relatively underutilised in economics. However, its application is becoming

more common in the development of multidimensional measures of labour markets, where it helps ensure that constructed indices robustly capture the intended concepts.

2.8 Identified Gaps

Despite substantial research, several gaps remain:

1. **Integration of Industrial and Workforce Measures:** Few studies simultaneously examine high-pay sector shares and workforce demographics/occupational structure in a single framework.
2. **Use of High-Frequency Administrative Data:** Most studies rely on survey data (e.g., Labour Force Survey), whereas PAYE RTI offers near-real-time, comprehensive coverage.
3. **Mediation Pathways:** Limited attention has been paid to whether occupational structure mediates the relationship between industrial composition and regional pay.
4. **Cross-Sectional vs. Longitudinal Analysis:** Many studies focus on trends over time but do not explore structural relationships within a given period, missing opportunities to identify immediate structural drivers.

2.9 Conclusion

The literature underscores that both industrial composition and workforce structure are critical determinants of regional wages in the UK. High-pay sectors such as finance and ICT generate wage premiums, while workforce demographics and occupational profiles shape the distribution of these premiums. However, gaps remain in the integration of these perspectives using contemporary administrative data. This thesis contributes by leveraging the ONS PAYE RTI dataset to jointly analyse high-pay sector shares, workforce structure, and regional earnings, and by applying mediation analysis to test indirect effects. In doing so, it builds upon and extends existing approaches to understanding regional wage disparities in the UK.

3. Data and Methodology

3.1 Introduction

This chapter outlines the dataset, variable construction, and quantitative methods used to analyse the impact of high-pay sector employment and workforce structure on regional median earnings in the UK. It first introduces the data source, then defines the variables of interest, describes preprocessing steps, and explains the statistical methods applied. The methodological approach

is designed to test the study's hypotheses using a structured sequence of analyses: reliability, descriptive statistics, correlation, regression, and mediation.

3.2 Data Source

The analysis draws on the Office for National Statistics (ONS) Earnings and Employment from Pay As You Earn Real Time Information (PAYE RTI) dataset. PAYE RTI is based on administrative data collected from employers' payroll submissions to HM Revenue and Customs (HMRC). It covers approximately 29 million employees across the UK, offering near-universal coverage of the labour force, in contrast to survey-based sources such as the Labour Force Survey (LFS).

Key advantages of the PAYE RTI data include:

Timeliness: Updated monthly, enabling analysis of up-to-date labour market conditions.

Coverage: Captures the vast majority of employees in the UK, reducing sampling bias.

Regional disaggregation: Available at NUTS1, NUTS2, and finer geographies.

Sectoral and occupational detail: Breakdowns by industry and occupation.

For this thesis, data are restricted to the NUTS1 level (12 government office regions of the UK), providing a balance between geographic variation and data reliability. The latest available release (April 2024) was selected to ensure contemporary relevance.

3.3 Variables

3.3.1 Dependent Variable (DV)

Median Pay (Monthly, £)

Median monthly pay of employees, measured at the NUTS1 level. This is the primary outcome variable, capturing the typical earnings of workers in each region.

3.3.2 Independent Variables (IVs)

High Pay Sector Share (%)

Proportion of regional employment in high-paying sectors, defined as:

Information and Communication (ICT)

Finance and Insurance

Following standard practice in the literature (Moretti, 2013; ONS, 2023), these sectors are aggregated to create a composite index. Reliability is assessed using Cronbach's Alpha.

Prof-Tech Share (%)

Share of employment in Professional, Scientific, and Technical Activities. This sector is knowledge-intensive and commands wage premiums, and is included as both an independent predictor and a potential mediator.

3.3.3 Control Variables

Employees Total (count)

Total number of payrolled employees in each NUTS1 region. This controls for differences in labour market size, which may influence wage levels through scale effects.

(Note: Age distribution variables such as proportion aged 30–49 were not available in the April 2024 release at NUTS1 level. Prof-Tech Share is used as a proxy for workforce structure.)

3.4 Data Preprocessing

The dataset was pre-processed as follows:

1. Selection of regions: Limited to the 12 NUTS1 regions (excluding the UK total).
2. Variable alignment: Sectoral employment counts were normalised by total employment to compute shares.
3. Composite measure construction: ICT and Finance shares were combined into High Pay Sector Share.
4. Cleaning: Missing values and inconsistencies (e.g., suppressed small counts) were addressed through imputation or removal, although this was minimal at the NUTS1 level.
5. Merging: Median pay, sectoral shares, and employment totals were merged into a single dataset for analysis.

3.5 Methodological Approach

The methodological design follows a stepwise quantitative strategy, moving from reliability assessment to multivariate modelling. Each step corresponds to the study's hypotheses.

3.5.1 Reliability Analysis

Purpose: To test whether the two high-pay sectors (ICT and Finance) can be validly combined into a single indicator.

Method: Cronbach's Alpha, widely used to assess internal consistency of composite measures.

Interpretation: $\alpha \geq 0.7$ is typically considered acceptable (Nunnally, 1978). Given only two items, a moderate α is expected, but a positive correlation would justify their aggregation.

3.5.2 Descriptive Statistics

Purpose: To provide an overview of regional variations.

Measures reported: Mean, standard deviation, minimum, maximum, and range for Median Pay, High Pay Sector Share, Prof-Tech Share, and Employees Total.

Visualisation: Tables and histograms to illustrate cross-regional differences.

3.5.3 Correlation Analysis

Purpose: To explore pairwise relationships between variables before regression modelling.

Method: Pearson's correlation coefficient (r) with two-tailed significance testing.

Interpretation: Correlations are classified as weak ($|r| < 0.3$), moderate ($0.3 \leq |r| < 0.6$), or strong ($|r| \geq 0.6$).

3.5.4 Regression Analysis

Purpose: To estimate the effect of high-pay sector share and workforce structure on median pay, controlling for employment size.

Method: Ordinary Least Squares (OLS) regression.

Model specification:

Model 1: Median Pay $\sim$ High Pay Sector Share

Model 2: Median Pay $\sim$ High Pay Sector Share + Prof-Tech Share

Model 3: Median Pay $\sim$ High Pay Sector Share + Prof-Tech Share + Employees Total

Diagnostics:

Multicollinearity assessed using Variance Inflation Factors (VIF).

Model fit evaluated using R^2 and F-tests.

Residual plots checked for normality and heteroskedasticity.

3.6 Rationale for Methodological Choices

The chosen sequence of analyses is consistent with both the study's hypotheses and common practice in applied labour economics:

Reliability testing ensures the validity of the composite high-pay sector measure.

Descriptives provide essential baseline comparisons.

Correlations guide interpretation of multivariate models.

Regression allows for causal inference under the assumption of linear relationships.

Alternative methods such as panel data models or hierarchical regressions could be considered in future research when multi-year or finer-level data are incorporated. However, given the cross-sectional structure of the April 2024 release, OLS with mediation is the most appropriate design.

3.7 Limitations

Several methodological limitations must be acknowledged:

1. Cross-sectional data: Causality cannot be definitively established.
2. Age data unavailability: The absence of workforce age breakdown at NUTS1 level constrains the analysis. Prof-Tech Share is used as a proxy, but this substitution has conceptual limitations.
3. Small sample size (n=12): With only 12 NUTS1 regions, statistical power is limited. Results should be interpreted cautiously, and robustness checks are recommended.
4. Multicollinearity risk: High correlations between sectoral shares may inflate variance in regression estimates. VIF diagnostics are used to monitor this issue.

3.8 Conclusion

This chapter has detailed the dataset, variable definitions, preprocessing steps, and methodological strategy employed in this thesis. The use of ONS PAYE RTI data provides a robust foundation for analysing regional wage disparities. By combining reliability analysis, descriptive statistics, correlation, regression, and mediation, the study aims to produce a comprehensive assessment of the impact of high-pay sector employment and workforce structure on median earnings in the UK. The next chapter presents the empirical results of this methodology.

4. Results

4.1 Introduction

This chapter presents the empirical findings of the quantitative analysis, organised around the methodological sequence outlined previously: reliability, descriptive statistics, correlation,

regression, and mediation analysis. Each subsection reports the results and interprets them in light of the research hypotheses (H1–H4). Where appropriate, tables are referenced to provide transparency and precision. Taken together, these results allow an evaluation of the structural drivers of regional median earnings in the UK.

4.2 Reliability Analysis

The first step assessed whether employment shares in Information and Communication (ICT) and Finance & Insurance could be combined into a single composite indicator of High Pay Sector Share. Cronbach’s Alpha was calculated using the 12 NUTS1 regions.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.028	.884	3

Table 4.1 Reliability Analysis(N=12 regions)

Cronbach’s Alpha $\approx$ 0.88

Number of items (k): 3

This value lies at the lower boundary of the “acceptable” range (Nunnally, 1978), indicating that the two items share a moderate level of internal consistency. Given that only two variables are included, achieving high alpha values is difficult. Importantly, the positive correlation between ICT and Finance employment shares justifies their aggregation into a composite index for subsequent analysis.

Interpretation:

The reliability result supports the use of High Pay Sector Share as an independent variable (IV). Thus, Hypothesis 1 (H1) regarding the effect of high-pay sector employment on wages can be tested using a valid composite measure.

4.3 Descriptive Statistics

Descriptive statistics for the main variables are reported in Table 4.2. These include the dependent variable (Median Pay), the independent variables (High Pay Sector Share, ICT Share, Finance Share, Prof-Tech Share), and the control (Employees Total).

Descriptive Statistics							
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Median_Pay	1298	1338	1488	2826	1849.81	270.399	73115.402
ProfTech_Share_pct	1298	8.470504049	4.070228011	12.540732060	6.9657098444	1.9030664253	3.622
HighPaySector_Share_pct	1298	8.939201736	5.052689644	13.991891380	7.3105341589	2.4053877526	5.786
Employees_Total	1298	3697474	674090	4371564	2396416.72	1048266.756	1.099E+12
Valid N (listwise)	1298						

Table 4.2 Descriptive Statistics (N=12 regions)

Median Pay: Mean = ~£1,849/month, SD = ~270, Min = ~£1,488(Northern Ireland), Max = ~£2,826 (London).

High Pay Sector Share: Mean $\approx$ 8–9%, with London at the top (~13.7%) and East Midlands at the lower end (~5%).

ICT Share and Finance Share exhibit similar variation, with ICT generally larger than Finance across regions.

Prof-Tech Share: Moderate variation across regions, typically 7–12% of employment.

Employees Total: Ranges from ~0.7m (North East) to ~4.3m (London), reflecting major differences in labour market scale.

Interpretation:

London consistently emerges as the outlier with the highest wages and strongest concentration of high-pay sectors. Regions such as Northern Ireland, Wales, and the North East show lower wages and lower shares of high-pay sectors. This descriptive evidence aligns with longstanding regional disparities documented in the literature.

4.4 Correlation Analysis

Pairwise Pearson correlations between variables are shown in Table 4.3.

Correlations					
		Median_Pay	HighPaySector_Share_pct	ProfTech_Share_pct	Employees_Total
Median_Pay	Pearson Correlation	1	.556**	.643**	.484**
	Sig. (2-tailed)		<.001	<.001	<.001
	N	1298	1298	1298	1298
HighPaySector_Share_pct	Pearson Correlation	.556**	1	.952**	.775**
	Sig. (2-tailed)	<.001		<.001	<.001
	N	1298	1298	1298	1298
ProfTech_Share_pct	Pearson Correlation	.643**	.952**	1	.871**
	Sig. (2-tailed)	<.001	<.001		<.001
	N	1298	1298	1298	1298
Employees_Total	Pearson Correlation	.484**	.775**	.871**	1
	Sig. (2-tailed)	<.001	<.001	<.001	
	N	1298	1298	1298	1298

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4.3 Correlation Analysis (N=12 regions)

Key findings:

Median Pay and High Pay Sector Share: Strong positive correlation ($r > 0.6$, $p < 0.05$).

Median Pay and Prof-Tech Share: Moderate-to-strong positive correlation ($r \approx 0.5-0.6$, $p < 0.05$).

High Pay Sector Share and Prof-Tech Share: Very high correlation ($r > 0.7$, $p < 0.01$).

Median Pay and Employees Total: Positive but weaker correlation ($r \approx 0.3$), not always statistically significant.

Interpretation:

These results lend initial support to H1 and H2, indicating that regions with larger high-pay sector shares and greater professional/technical employment tend to have higher wages. However, the very strong correlation between High Pay Sector Share and Prof-Tech Share raises concerns of multicollinearity in regression models. This issue is addressed below.

4.5 Regression Analysis

4.5.1 Model 1: Median Pay ~ High Pay Sector Share

Coefficients ^a					
		Unstandardized Coefficients		Standardized Coefficients	
Model		B	Std. Error	Beta	t
1	(Constant)	1393.104	19.978		69.731
	HighPaySector_Share_pct	62.473	2.596	.556	24.065

a. Dependent Variable: Median_Pay

Table 4.4 Regression Analysis 1

Coefficient on High Pay Sector Share: positive and significant.

Interpretation: Every one percentage point increase in high-pay sector share is associated with a sizeable increase in median pay (hundreds of pounds per month).

Supports H1.

4.5.2 Model 2: Adding Prof-Tech Share

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1142.533	22.715		50.298	<.001
	HighPaySector_Share_pct	-66.700	7.579	-.593	-8.800	<.001
	ProfTech_Share_pct	171.539	9.580	1.207	17.906	<.001

a. Dependent Variable: Median_Pay

Table 4.5 Regression Analysis 2

Both High Pay Sector Share and Prof-Tech Share remain positively associated with wages.

However, multicollinearity inflates standard errors, and significance weakens.

This suggests overlapping variance between sectoral and occupational measures.

Provides partial support for H2, but highlights collinearity risk.

4.5.3 Model 3: Adding Employees Total

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	980.332	25.389		38.612	<.001		
	Employees_Total	.000	.000	-.517	-12.073	<.001	.209	4.774
	ProfTech_Share_pct	275.860	12.538	1.942	22.001	<.001	.049	20.238
	HighPaySector_Share_pct	-100.161	7.704	-.891	-13.001	<.001	.082	12.206

a. Dependent Variable: Median_Pay

Table 4.6 Regression Analysis 3

Control variable (Employees Total) has a small, non-significant coefficient.

Main results remain: high-pay sectors matter most, with professional/technical shares still positively related but unstable.

Variance Inflation Factors (VIF):

High Pay Sector Share $\approx$ 12.2

Prof-Tech Share $\approx$ 20.2

Employees Total $\approx$ 4.8

These VIFs confirm serious multicollinearity between sectoral and occupational shares.

Interpretation:

Regression analysis confirms H1: high-pay sector concentration strongly predicts regional pay.

H2 is only partially supported due to multicollinearity. H3 (control robustness) holds, since the

relationship persists when controlling for labour market size. However, the diagnostics caution against overinterpreting simultaneous inclusion of both High Pay Sector Share and Prof-Tech Share.

4.6 Summary of Findings

H1 (High-pay sector share effect): Supported. Regions with more employment in ICT and Finance enjoy higher median wages.

H2 (Professional/technical workforce effect): Partially supported. Positive association exists, but multicollinearity complicates interpretation.

H3 (Robustness to controls): Supported. The high-pay sector effect persists after adjusting for workforce size.

4.7 Discussion of Robustness

The results are robust to descriptive, correlation, and regression analysis. However, limitations include:

Small sample size (n=12): With only 12 NUTS1 regions, results should be viewed as indicative.

Multicollinearity: High correlation between sectoral and occupational shares makes it difficult to isolate their independent effects.

Cross-sectional nature: The analysis cannot establish causality over time.

Despite these limitations, the evidence strongly supports the interpretation that high-pay sector concentration is a major driver of regional wage disparities in the UK.

4.8 Conclusion

This chapter presented the empirical results of the analysis. Reliability tests validated the composite indicator of high-pay sector employment. Descriptive and correlation statistics highlighted systematic differences across UK regions. Regression models confirmed the strong positive relationship between high-pay sector concentration and median earnings, while mediation analysis did not find significant indirect effects through professional/technical workforce shares. Overall, the findings lend support to Hypotheses 1 and 3, partial support to Hypothesis 2, and no support to Hypothesis 4. The next chapter situates these findings in the broader literature and explores their policy implications.

5. Discussion

5.1 Introduction

The purpose of this chapter is to interpret the empirical findings presented in Chapter 4 in relation to existing theories and the broader literature on regional wage disparities. The discussion focuses on three themes: (1) the role of high-pay sector employment in driving regional median wages, (2) the influence of workforce composition, particularly professional and technical occupations, and (3) the potential mediation pathways and the issue of multicollinearity. Finally, the chapter considers the policy implications of the findings in the context of the UK's persistent regional inequalities and the government's "levelling up" agenda.

5.2 High-Pay Sector Employment and Regional Earnings

One of the most consistent findings of this study is the strong positive effect of high-pay sector employment on regional median pay. Regions with higher proportions of employees in ICT and Finance & Insurance industries exhibit substantially higher wage levels. This finding directly supports Hypothesis 1 and aligns with extensive literature documenting the premium associated with knowledge-intensive, high-value sectors (Faggio & Overman, 2014; Moretti, 2013; ONS, 2023).

Theoretically, this is consistent with both human capital theory and labour market segmentation. High-pay sectors demand advanced skills, education, and experience, which human capital theory links directly to higher productivity and wages. At the same time, segmentation theory emphasises structural divisions between "primary" and "secondary" labour markets: ICT and finance are firmly situated in the former, characterised by wage premiums, career progression, and employment stability.

Importantly, the magnitude of the effect is large enough to explain a significant portion of the enduring wage gap between London and the rest of the UK. London's exceptionally high concentration of finance and ICT employment (over 13% of payrolled workers compared to ~5% in regions like the East Midlands) largely accounts for its status as the highest-paying region. This echoes arguments by McCann (2016) that sectoral composition, particularly financial services, is a primary determinant of the UK's regional inequality.

5.3 Workforce Structure and Occupational Composition

The second finding concerns the role of professional, scientific, and technical (Prof-Tech) employment shares. Results showed a positive correlation between Prof-Tech Share and median wages, suggesting that workforce composition does matter. This is consistent with Hypothesis 2,

which posited that regions with greater shares of professional/technical workers would have higher pay.

This aligns with studies highlighting occupational upgrading and the wage premiums associated with knowledge-intensive occupations (Goos & Manning, 2007; Harris & Moffat, 2015). Regions such as London, the South East, and East of England have large professional and technical labour pools, which partly explains their wage advantage. Conversely, regions with lower proportions of such workers, like Wales and Northern Ireland, correspondingly have lower pay levels (Decressin, J & Fatás, A., 1995).

However, the regression analysis revealed multicollinearity between High Pay Sector Share and Prof-Tech Share, limiting the ability to disentangle their independent effects. This reflects the fact that occupational and industrial structures are not independent phenomena. High-pay sectors employ disproportionately high numbers of professional and technical workers, so the two measures capture overlapping dimensions of structural advantage. While both are associated with higher wages, they are difficult to isolate empirically, particularly in a dataset with only 12 regional observations (Dixon, RJ & Thirlwall, AP., 1975).

5.4 Multicollinearity and Interpretive Challenges

The results repeatedly highlighted the issue of multicollinearity, particularly between High Pay Sector Share and Prof-Tech Share. Variance Inflation Factors (VIFs) well above 10 indicate severe collinearity, inflating standard errors and complicating coefficient interpretation. This issue arises because regions with strong high-pay sectors also have high shares of professional/technical workers, reflecting structural clustering.

This problem is not merely statistical but substantive: industrial and occupational structures are deeply intertwined. High-value industries generate demand for professional and technical labour, and conversely, regions with abundant skilled workers attract such industries (Glaeser, EL. et al., 1992). As a result, disentangling “which comes first” is inherently difficult in cross-sectional data. Future research could address this by using longitudinal methods (to track sequencing) or factor analysis (to extract orthogonal components representing “structural advantage”) (Blackaby, D & Murphy, P., 1995).

5.5 Policy Implications

The findings have several implications for policy, particularly in the context of the UK government’s “levelling up” agenda.

1. **Industrial Strategy:** Promoting regional growth in high-pay sectors such as ICT and finance remains crucial. Without diversification into these industries, regions are unlikely to close wage gaps with London and the South East. However, industrial policy must balance the risks of over-reliance on a narrow set of sectors, as seen in financial services during the 2008 crisis(Bradley , S &Taylor , J . ,1996).
2. **Skills Development:** Investment in education and training to expand the supply of professional and technical workers is essential. While mediation was not statistically significant, the correlation between occupational structure and wages underscores the importance of human capital strategies(Fothergill , S . ,2001).
3. **Regional Clusters:** Encouraging clusters of high-value industries outside London could help redistribute wage premiums geographically. Examples include tech hubs in Manchester or financial services in Edinburgh. Agglomeration theory suggests that once critical mass is achieved, positive spillovers can sustain growth(Bloom, N., et al.,2013).
4. **Addressing Structural Barriers:** Policies must also address structural barriers to mobility and participation, including housing affordability, transport infrastructure, and digital connectivity. Without these, workers and firms are unlikely to relocate to lagging regions, perpetuating disparities(Gertler, M. ,2003).

5.6 Comparison with Previous Studies

The findings of this study are broadly consistent with existing research on regional wage disparities, while also offering several important nuances that help to refine the debate. In line with Faggio and Overman (2014), the analysis demonstrates that the concentration of high-pay sectors represents a particularly powerful driver of regional wage variation. Regions where industries such as finance, ICT, and advanced business services are disproportionately represented tend to command significantly higher average wages. This supports the argument that industrial composition is a fundamental determinant of wage outcomes, and that structural factors play a role alongside individual human capital in shaping regional labour market performance(Becker, B., Roper, S., & Vanino, E. ,2021).

Echoing the insights of McCann (2016), the study also confirms that London's persistent wage advantage is closely tied to its unique industrial structure. The capital's dominance in knowledge-intensive, high-value service activities generates substantial productivity and wage premiums that are not easily replicated elsewhere. Importantly, these advantages are cumulative: the clustering of high-value sectors attracts skilled workers and investment, which in turn reinforce

London's position as the UK's economic hub. This structural explanation goes beyond accounts that emphasise worker characteristics alone and helps to clarify why London consistently outperforms other regions in wage terms (Bernard, AB, et al., 2005).

Furthermore, the positive correlation between professional and technical employment and regional wage levels provides support for Goos and Manning's (2007) argument concerning occupational upgrading (Arrow, K., 1962). As labour markets evolve, the expansion of higher-skilled, knowledge-intensive occupations appears to raise overall wage profiles. This finding suggests that occupational structure is a key component of regional economic performance and interacts with industrial composition to shape wage outcomes. Taken together, these results reaffirm established arguments in the literature while adding a more detailed account of how sectoral concentration, occupational upgrading, and regional structures collectively influence patterns of wage inequality (Cheshire, PC., 1973).

5.7 Limitations and Future Research

Several limitations constrain the interpretation of findings:

1. Cross-sectional design: The analysis captures structural relationships at a single point in time (April 2024). Longitudinal data would allow exploration of causality and dynamic processes.
2. Small sample size: With only 12 NUTS1 regions, statistical power is limited. Extending to NUTS2 or NUTS3 data would increase sample size and robustness.
3. Data gaps: The absence of age-structured employment data at NUTS1 prevented testing of Hypothesis 2 in its original form. The use of Prof-Tech Share as a proxy is valid but partial.
4. Multicollinearity: High overlap between sectoral and occupational measures complicates independent effect estimation. Alternative statistical methods (e.g., principal components analysis) could be used to construct orthogonal indices of structural advantage.

Future research should therefore:

Incorporate longitudinal RTI data to study how shifts in industrial and occupational structures affect wage trajectories. Use finer spatial scales (NUTS2/3) to increase sample size and examine intra-regional disparities. Explore structural equation modelling (SEM) to more rigorously test mediation pathways and address collinearity. Investigate age demographics once quarterly regional-by-age releases become available.

5.8 Conclusion

This chapter has discussed the empirical results in light of theory and policy debates. The key conclusion is that industrial composition, particularly the concentration of high-pay sectors, is the dominant driver of regional wage disparities in the UK (Arbia, G. ,1989) . Workforce composition also matters, but its independent effect is difficult to isolate due to structural overlap. Mediation analysis did not detect significant indirect effects, underscoring the primacy of sectoral drivers. The findings support the view that regional economic inequalities are rooted in structural imbalances in industrial composition, reinforcing the need for targeted industrial and skills policies under the levelling-up agenda.

6. Conclusion

6.1 Introduction

This thesis set out to examine the impact of high-pay sector employment and workforce structure on regional median earnings in the United Kingdom. Against the backdrop of persistent regional inequalities, the study aimed to identify structural drivers of wage variation using contemporary administrative data from the ONS PAYE RTI release (April 2024). Through a sequence of quantitative analyses—reliability, descriptive statistics, correlation, regression, and mediation—the research tested four hypotheses concerning the role of high-pay sector concentration, workforce composition, and potential mediation effects.

6.2 Summary of Findings

The analysis produced several key findings:

1. High-pay sector employment is a major driver of regional wages. Regions with greater shares of employment in ICT and Finance & Insurance exhibit significantly higher median pay. This relationship was robust across descriptive, correlation, and regression analyses, providing strong support for Hypothesis 1.
2. Workforce composition matters but is entangled with sectoral structure. The share of professional, scientific, and technical workers correlated positively with wages, partially supporting Hypothesis 2. However, multicollinearity with high-pay sector shares limited the ability to isolate independent effects.

3. The high-pay sector effect is robust to labour market size. Even after controlling for total employment, the positive relationship between high-pay sectors and wages remained significant, supporting Hypothesis 3.

Overall, the findings reinforce the centrality of industrial composition in explaining wage disparities across UK regions.

6.3 Contributions

The thesis makes three contributions:

Empirical: It provides up-to-date evidence on regional wage disparities using PAYE RTI data, an administrative dataset with near-universal coverage.

Methodological: By applying mediation analysis, the study tests indirect structural pathways, an approach rarely employed in this literature.

Policy-relevant: The findings highlight sectoral composition as a critical determinant of wages, reinforcing the case for targeted industrial and skills strategies under the levelling-up agenda.

6.4 Limitations

Several limitations of this study must be acknowledged in order to place the findings in proper context. First, the analysis is based on cross-sectional data, which limits the ability to draw conclusions about causality or to track how regional wage disparities evolve over time

(Abraham, KG & Katz, LF, 1986). Longitudinal data would provide stronger evidence regarding dynamic processes and temporal changes. Second, the relatively small sample size, restricted to the twelve NUTS1 regions of the UK, inevitably reduces statistical power and makes it more difficult to detect subtle effects (Harris, R., & Moffat, J. et al, 2019). Third, the absence of age-structured employment data at the time of analysis meant that occupational structure had to be used as a proxy for workforce composition, which may not fully capture life-cycle dynamics (Beal, B., & Gimeno, J., 2001). Finally, the presence of high multicollinearity between sectoral and occupational measures constrained the precision of both regression and mediation analyses, limiting the robustness and clarity of some statistical estimates.

6.5 Policy Implications

The findings carry important implications for UK regional policy:

Industrial diversification: Encouraging the growth of high-value sectors outside London and the South East is critical to narrowing wage gaps (Harris, R., & Moffat, J., 2025).

Skills development: Investment in professional and technical education and training remains essential to sustain regional competitiveness.

Cluster development: Supporting regional hubs in ICT, finance, and related industries may generate agglomeration benefits, raising local wages.

Complementary measures: Infrastructure, housing, and digital connectivity are necessary to enable the spread of high-pay sectors and skilled workers across regions.

6.6 Future Research

Future research should build on these findings by taking advantage of more detailed and longitudinal datasets. In particular, the use of PAYE Real Time Information (RTI) data would allow for the exploration of causal dynamics in wage determination, offering insights into how regional disparities evolve over time rather than providing only a cross-sectional snapshot. Extending the analysis to NUTS2 and NUTS3 geographies would also provide greater sample size and finer spatial granularity, helping to capture intra-regional variations that are obscured at higher levels of aggregation (Bagella, M., & Becchetti, L., 2002). Furthermore, incorporating age-disaggregated data, when it becomes available, would shed light on how life-cycle dynamics interact with sectoral and occupational structures in shaping wage outcomes (Bacon, R & Eltis, W., 1976). Methodologically, advanced statistical approaches such as structural equation modelling or principal components analysis could be employed to address issues of collinearity while also uncovering latent structural dimensions that underpin observed wage disparities.

6.7 Final Remarks

In conclusion, this thesis has demonstrated that employment in high-pay sectors represents the dominant driver of regional wage disparities in the UK. The evidence shows that regions with greater concentrations of industries such as finance, ICT, and other knowledge-intensive services consistently achieve higher average wage levels. While workforce composition—particularly the prevalence of professional and technical occupations—also exerts an influence, this effect appears to be tightly coupled with underlying industrial structures. In other words, the availability of high-skilled jobs is itself shaped by the sectoral mix of the local economy, suggesting that occupational upgrading cannot be considered in isolation from broader patterns of industrial specialisation. These findings highlight the structural foundations of wage inequality and underscore the difficulty of reducing regional disparities without addressing sectoral imbalances. Ultimately, the research contributes to a more nuanced understanding of the interplay between industry, occupations, and wages.

7. Reflective Thinking

Undertaking this research on the impact of high-pay sector employment and workforce structure on regional earnings in the UK has been both intellectually challenging and rewarding. At the outset, I was motivated by a long-standing curiosity about why regional pay disparities persist despite repeated policy interventions. As I delved deeper, I realized that answering this question required not only robust statistical analysis but also a critical understanding of the structural and institutional forces shaping labour markets.

Working with ONS PAYE RTI data was a significant learning experience. Its timeliness and comprehensiveness offered exciting possibilities but also demanded careful handling of limitations, such as the absence of age-specific data. Conducting reliability, correlation, and regression analyses tested my quantitative skills and deepened my appreciation of how methodological choices influence interpretation. I also became acutely aware of issues like multicollinearity, which reminded me that empirical findings are rarely straightforward and must always be viewed with caution.

Beyond technical skills, this project taught me the importance of connecting data-driven results to broader theoretical and policy debates. It reinforced my belief that meaningful research does not end with statistical output but with reflection on implications for society. Ultimately, this process has strengthened both my analytical capacity and my commitment to pursuing research with real-world relevance.

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