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Flexibility or Power? A Difference-in-Differences Test of the Remote Work Wage Discount

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ABSTRACT

Remote work has expanded substantially, giving workers greater flexibility while raising questions about whether differences in remote and on-site wages reflect workers' willingness to trade income for flexibility, and how long such wage discounts last. The research question investigates, if compensating differentials persist or whether the wage discount for remote work shrinks as remote job options in an occupation expand. A difference-in-differences framework was used to compare occupations experiencing relatively high and low growth in remote job opportunities. The analysis combines occupation-level remote job-posting data from WFH Map with wage data from the American Community Survey analysed by Pablonia and Vernon. Occupational wage information from the U.S. Bureau of Labor Statistics is also used to provide additional wage context. The high-expansion occupations experienced a 6.62 percentage-point increase in their remote wage differential compared with a 1.05 percentage-point increase in low-expansion occupations, producing a +5.57 percentage-point difference-in-differences estimate, indicating that, relative wage position of remote workers improved more strongly where remote employment opportunities expanded, providing partial support for the monopsony mechanism. The relatively limited period and data constraints mean that longer-term changes in the remote labour market may be needed to determine whether the wage discount predicted by the monopsony hypothesis becomes more evident over time.

Keywords: Remote work; Wage differentials; Rosen's compensating differentials; Monopsony; Labour market power; Outside options; Difference-in-differences

JEL Codes: J31 (wage differentials), J42 (monopsony).

1. INTRODUCTION

The rapid expansion of remote work during the pandemic times, and motivated now because of the deep progression in technology, has changed the ways of operation of labour markets worldwide. Remote works and their related technology have not only altered where employees work, but they have also changed the characteristics that workers and firms exchange through employment. Remote work provides valuable non-pecuniary benefits, such as greater flexibility in work hours, reduced commuting time and greater control over working conditions. This introduces the remote wage discount concept. The remote wage discount is the reduction in base salary that companies will apply and the employees will willingly accept, in exchange for the flexibility. The compensating differential here is the value that employees associated with the non-pecuniary benefits. For instance, market data shows that technical workers accept up to a 25% pay cut for remote work in exchange for non-monetary perks like flexible work timings, zero commute etc., While there are benefits in remote work, when considering the wage context of work and remote work, there are some ambiguous concerns. The increasing evidence of a wage difference between remote and non-remote work raises an important economic question: does a lower wage represent a worker's voluntary trade-off for flexibility, or does it reflect employers' ability to exercise greater bargaining power over workers? From the economic perspective, understanding this distinction is important because the observed wage discount can arise from different labour market mechanisms.

This paper examines 'whether the remote-work wage discount decreases as remote job opportunities become more prevalent within an occupation'.

The aim of the examination happens within two competing economic explanations (*Rosen's theory of compensating differentials and Manning's model of employer monopsony*) that are the theory base for this this investigation.

Rosen's theory of compensating differentials presents the idea that workers value combinations of wages and non-pecuniary job characteristics when making the decision to take up a job or continue it (Daw, & Hardie, 2012). When a remote work opportunity presents amenities that the workers value, then they might rationally accept a lower wage as tradeoff for amenities like greater flexibility. Under this idea of compensating differentials, it is assumed that the wage discount is primarily only a reflection of the workers' valuation of remote work. As such, this remains relatively stable, even as the number of remote positions increase. Here the power of choice lies with the worker, with the worker choosing their wage discount solely based on the amenities they are offered in remote work. However, in contrast, the *Manning's model of employer monopsony* suggests that, as remote options of work increases, the power moves from worker to employers, with the employer being dominant buyers of labour, and their power to depress wages is high. Under employer monopsony, wages are determined at below competitive levels, while workers do not have much options outside remote employment. With more employers offering remote positions, with workers gaining additional alternatives, there will be greater competition for workers. This will reduce employers ability to sustain the wage discount, and remote wage discounts might shrink over time. Therefore, *Manning's model of employer monopsony* offers a competing prediction to *Rosen's theory of compensating differentials*, on how remote-work wage discount responds to an expansion in remote job opportunities.

This paper aims to test these two competing predictions with a difference-in-differences framework. It compares changes in the remote-work wage discount after 2020 between occupations experiencing substantial increases in remote job postings and occupations experiencing relatively limited expansion. Data from the remote-work patterns are collected from existing secondary sources, such as the *Survey of Working Arrangements and Attitudes and remote-job-posting data*, and the occupational wage information data is collected from the *U.S. Bureau of Labor Statistics*. Occupation level data on remote job postings, extent of expansion, worker-level wage data, wage difference between remote and non-remote workers and more, are the data used. Evidence on workers' valuation of flexibility, including experimental estimates from studies like that of Mas and Pallais (2017), provides additional context for interpreting the compensating-differentials mechanism.

The analysis basically contributes to the debate by distinguishing between two mechanisms to understand if expansion in remote job opportunities is associated with a reduction in the remote work wage discount. Comparisons within occupations and states are therefore used to reduce, although not completely eliminate, these sources of selection bias.

A difference-in-differences framework then compares changes in the remote-work wage discount between high- and low-expansion occupations. A shrinking wage discount in occupations with greater growth in remote opportunities would be consistent with Manning's monopsony model, as increased employer competition expands workers' outside options. If the discount remains relatively stable, this would instead be consistent with Rosen's compensating-differentials framework, in which the discount primarily reflects workers' valuation of remote-work flexibility.

The aim of this paper is to determine whether the wage discount associated with remote work changes as remote job opportunities expand within occupations, and to assess whether the observed relationship is more consistent with Rosen's theory of compensating differentials or Manning's model of employer monopsony power, using a difference-in-differences approach.

2. LITERATURE REVIEW

2.1 Introduction

The expansion of remote work during and after the pandemic generates considerable debates on implications for wages, and labour market power (Benett, 2025; Barrero et al. 2021). This literature review presents existing research studies into remote-capable occupations, why and how they surged, their implications for wage growth, remote wage discount, and worker preferences for non-pecuniary amenities and differences in employers' bargaining power. The following review examines study insights in the context of the two main theory bases, and also identifies the gap motivating this study.

2.2 Remote Work and Wage Inequality

The pandemic modified wage inequality. Studies have examined how the shift to remote work during the pandemic reshaped wages across occupations in the United States, with focus on how the pandemic reshaped skill development and wages (Benett, 2025). Researchers acknowledge how existing studies have turned in ambiguous results. For instance, task based theories show how tasks were being pushed to remote working, and in doing so, some jobs were able to adapt better than others. For instance, jobs in cognitive areas, non-routine tasks of finance and IT were able to adapt to telework better than manual and other service jobs, such as in food manufacturing and services. Therefore, the nature of the job, and the flexibility it allowed in being able to allow remote working, on account of the nature of the job, was what gave them a better advantage. Researchers note that even before the pandemic, teleworking jobs paid more at \$35 per hour versus \$20 for non-remote roles (Benett, 2025). During the pandemic, the remote capable sectors were able to recover faster, while others faced prolonged disruption, and therefore wage divergence was also seen as a consequence of this. However, compensating differentials offsets the pattern, as employees might in future trade off pay for flexibility, safety or autonomy. In countries like the UK, remote workers lagged behind in wage growth compared to on-site workers. Indeed, UK data suggest remote workers' wage growth lagged slightly behind on-site workers post-2020. Bennett (2025) set out to explore whether there was a similar inequality in the US market, with a differences-in-differences framework with data was collected from the Current Population Survey (CPS) and the American Time Use Survey (ATUS). The difference in differences framework is a statistical method for determining the causal effect of specific policy or event with respect to change in outcomes over time, with first difference measuring outcome variable changes over time, and second difference measuring before and after change within the group being studied. Comparing the outcomes for remote-capable jobs, as well as non-remote occupations post pandemic. The results showed that remote capable jobs associated with significantly higher wage growth. They had a wage growth of nearly 4-5

percent, relative to non-remote jobs. The remote-working occupations showed greater gains in educational attainment as well as digital skill engagement, compared to non-remote occupations where there were greater disruptions in access to training.

An important sub-finding from Bennetts research for compensating differentials is that remote work can facilitate greater investment in skills because of the reduced commuting time, reduced infrastructural costs and more. The investment as such can create more jobs, better wages for the remote worker community. Even global surveys have established that workers were willing to retrain and improve their digital skills and others during the pandemic, with online platforms like Coursera and Udemy reporting an almost 200 percentage in 2020. Accelerated skill development meant better wage negotiation and workers in remote capable occupations likely remains employed even as the disruptions continued in other sectors.

2.3 Worker Preferences and the Value of Flexibility

Even without wage discount, some preferred flexibilities of employees motivated them to participate in remote working. The quietness of the home, the convenience of working from home and others were notable aspects contributing to this preference. Bloom et al. (2015) conducted a nine-month randomized controlled trial on remote work within a travel related sector in China, and found a 13 percent increase in employee performance among remote workers. The quiet work environment, the convenience of being home etc., were preferred by these workers, as it helps them work better for the same wages. Barrero et al. (2021) surveyed many working age Americans during the multiple waves of the pandemic, and found that the pandemic equipped workers to experiment across remote technologies and in addition to productivity gains, preferred to save time in commute, an amenity that made remote working preferable. Similar other studies, like that of Bloom et al. (2024), conducted as a randomized control trial showed how shifting to hybrid WFH was a preferred option because of the savings in commuting times, costs, improved flexibility etc., Work-life balance as a preferred amenity in remote jobs was noted by Choudhury et al. (2024) who conducted a randomization experiment during the COVID-19 pandemic involving human-resource and microfinance employees in Bangladesh.

While amenities were considered as a reason for people opting for remote work, these form of works need not always translate into better wages. Pabilonia and Redmond (2024) established this in their study on 61 private industry sectors in the U.S. from 2019 to 2022, where they found that remote work adoption held some positive aspects for the workers, but the cost savings for companies did not translate into higher compensation for workers over the two-year period, Employees only benefitted indirectly. In some cases, remote workers felt that not only did their wage not improve, but they were exploited as well. This is evidence in the study of Gibbs et al. (2023) who made use of analytics data from a major IT company in India. The researchers measured the productivity of employees in the firm before and after pandemic lockdown. The data suggested that remote employees not only showed same productivity but also worked more longer hours and as a result, compared to non-remote workers, their productivity appeared to drop by 8-19% in comparison. The increased communication, coordination, and collaboration costs were identified as reasons for the loss of productivity. A disproportionate sense of burden, work-life balance issues etc. were possible reasons for this lack of productivity and increased work hours for the same wages. Companies while making savings in the form of reduced infrastructure costs, were passing on the costs to the employees. So, wage discounts were already an issue even during the pandemic periods and not all employees received them, instead costs were being pushed onto them. So, if theoretically wage discounts reduce with more remote jobs, then it would be a negative externality that would be borne more by the employees.

2.4 Compensating differentials

Existing research provides evidence for both the compensating-differentials and bargaining-power explanations of remote-work wages. Rosen's (1986) theory of compensating differentials predicts that workers trade wages against non-pecuniary job characteristics, implying that desirable amenities can be associated with lower wages. Empirical evidence supports the existence of substantial worker valuation of remote work. Mas and Pallais (2020), using a field experiment, found that applicants were willing to accept approximately an 8% wage reduction for the option to work from home, providing direct evidence that remote work has monetary value to workers. Similarly, Barrero et al. (2021) argue that remote work provides amenity value through reduced commuting and greater flexibility, while Mas and Pallais (2020) show that preferences for alternative work arrangements vary considerably across workers.

However, the observed relationship between remote work and wages is not unambiguous. Pabilonia and Vernon (2025) find that remote workers generally earned higher wages than on-site workers, although the relationship varied substantially across occupations and periods. Their finding that greater remote-work intensity within occupations was associated with stronger wage growth demonstrates why a simple comparison between remote and non-remote workers cannot establish a wage penalty. Cullen, Pakzad-Hurson and Perez-Truglia (2025) provide further evidence of strong preferences for remote work: technology workers were willing to accept substantial pay reductions for remote arrangements. Yet, despite this preference, the authors did not find the expected lower compensation for remote positions, suggesting that worker sorting, productivity and labour-market frictions may offset the compensating differential. This suggests that worker sorting, productivity differences and labour-market frictions can offset the compensating differential predicted by worker preferences alone (Pabilonia and Vernon, 2025; Cullen & Perez-Truglia, 2025).

2.5 Remote Work, Outside Options and Employer Power

The alternative explanation derives from monopsony theory. Manning (2003) argues that employers can exercise wage-setting power when workers face limited outside options. Remote work may weaken this power by expanding the geographical range of potential employers. Evidence from the UK similarly suggests that remote working can reduce the geographical constraints that contribute to local monopsony power.

Although existing studies establish that workers value remote work and that remote work is associated with heterogeneous wage outcomes, the literature has not directly established whether the remote-work wage discount changes systematically as the availability of alternative remote employers expands within an occupation. This distinction is crucial because Rosen's compensating-

differentials framework predicts a relatively stable wage discount reflecting workers' valuation of flexibility, whereas Manning's monopsony framework predicts that greater employer competition should reduce the discount.

2.6 Research Gap

Existing research studies establish key findings for this investigation. 1) The worker does place substantial value on remote work flexibility. 2) Remote work is therefore associated with much heterogeneous wage outcomes across workers in different occupations and 3) The literature cannot directly establish if the remote work wage discount changes systematically with availability of more remote work employers within an occupation. This is the research gap that will be addressed in this study. The distinction presents the motivation for applying both Rosen's compensating-differentials and Manning's monopsony framework. *Rosen's compensating-differentials* framework predicts that the wage discount should remain relatively stable because it reflects workers' valuation of remote-work amenities. In contrast, Manning's monopsony framework predicts that the discount should shrink as more employers offer remote positions and workers gain additional outside options. By comparing changes in the remote-work wage discount across occupations experiencing different degrees of expansion in remote job opportunities, this study directly tests these competing predictions using a difference-in-differences framework.

3. THEORY/FRAMEWORK

3.1 Rosen's theory of compensating differentials

Workers accept jobs based on a variety of criteria. Earnings are considered as a critical factor in this decision, but workers also have other preferences that might make them willing to accept jobs that pay less but offers flexibility in hours of working, insurance, commute and more (Daw, & Hardie, 2012). If choosing a job, spending time on it, and being compensated for one's time is a choice, then workers might choose jobs that offers them a balance of certain preferences. *The Rosen* (1986) model presents a theoretical framework for understanding these tradeoffs.

The core mechanics of the model are worker heterogeneity, firm heterogeneity, Rosen-Roy sorting, and the Hedonic wage function. Rosen does not view job as a single homogenous activity. It is modelled as a tied package with explicit wages, and also other implicit non-pecuniary attributes, such as the physical risk of working the job, work conditions, inconvenient hours of working and so on. Firms too face difference in technological or cost constraints in providing the needed safe or pleasant working environments. Market equilibrium also plays a role here, as it matches workers to firms based on joint-optimization. Compensating differentials is the higher pay that the company must pay in a perfect competition setting to compensate for bad working conditions or others. It also plays a role as a positive amenity, where the compensation differential works in the opposite direction. Workers can end up accepting lower wages in exchange for a job that offers them something preferable, such as flexible working or remote working.

As per the *Rosen model*, if there is a competitive labour market, with a variety of jobs with wages W , and amenities A , then workers will choose between jobs that provide the maximize utility,

$$u_i(W, A)$$

- A is considered to include both the good and bad job characteristics, and within A a reduction in disamenities can be expressed as an increase in amenities and vice versa.
- u_i indicates the different workers denoted by i , with different preferences for amenities relative to wages.

The simplified version of the *Rosen model* assumes all workers have the same productivity (Lavetti, 2023).

Workers have the right to choose where to sell their services in the labor market, and what wage rate R , as well as how much A to buy. It is assumed that the price of A is the implicit reduction in wage rate because of worker's decision to accept the reduction on account of some other job criteria that appeals to them, and they wish to choose. If two otherwise comparable jobs pay different wages, because one has undesirable or desirable amenities A , then this wage difference is called the compensating differential. All workers might not accept the same wage reduction as they do not aim for the same amenities. Based on the amenities they prefer, they might take flexible reductions in wages. Those who need no amenities will prefer zero reduction in wages. Thus, the market clears through a non-linear locus of wage-amenity offers, also called the hedonic wage function. The marginal cost of providing an amenity to a firm will equal the marginal workers valuation of that amenity.

Applied to remote work, the Rosen model thus treats flexibility as a positive non-pecuniary job characteristic. The ability to work remotely may make a worker willing to accept lower wage and the resulting wage difference between otherwise comparable remote and non-remote work represents the compensating differential. The size of the wage discount must reflect the worker's marginal valuation of remote flexibility rather than the number of firms offering remote positions. If workers' preferences for flexibility and the productivity characteristics of the occupation remain broadly stable, an increase in the availability of remote jobs does not by itself change the utility trade-off between wages and flexibility. The hedonic wage relationship should therefore remain relatively stable as the prevalence of remote work increases.

Consequently, the compensating-differentials model predicts that occupations experiencing a large expansion in remote-work opportunities should not systematically experience a larger reduction in the remote wage discount than occupations with little expansion. This produces the first testable hypothesis:

H1 (compensating differentials): The remote wage discount stays roughly constant regardless of how common remote jobs are in an occupation.

As per hypothesis 1, remote workers earn less, but that is because they choose flexibility over pay, and the remote wage discount is not controlled in the market by the employers. It is the worker who prefers and takes the wage discount.

3.2 Manning's Monopsony model

Yet another theory that can oppose hypothesis 1, is *Manning's Monopsony model*. If workers trade pays for flexibility, then it is a fair market outcome. However, if employers were to use their bargaining power to reduce pay, then the gap is rent extraction and trade-off for flexibility. The theory of Rosen on the compensating differentials opposed Manning's Monopsony model.

As per Manning's Monopsony model, there are important frictions in the labour market, meaning there are rents to jobs. If an employer and their worker were to be forcibly separated, then both the parties would be worse off. The employer therefore has some market power over the worker, because they understand that a worker will not forcibly extricate themselves in a work situation. The employer knows a small wage cut will not induce them to leave the firm. Therefore, in the market there is monopsony at work, and not perfect competition. Monopsony in general is a single market structure, where only one buyer has substantial control over a market because they are the only major purchaser of goods, services, or labor from many would-be sellers. The monopsony here is not in the sense of there being a single buyer of labour, but monopsony in the sense that the supply of labour to an individual firm need not be infinitely elastic.

Manning's argument for monopsony makes sense because if the wage were to be cut in a small manner, the workers will not instantly quit. If it was an ideal perfect competitive market, they would quit. In reality employees will ponder other jobs, look at mobility options to switch jobs and others, and will not quit immediately. This highlights how employers have wage setting power because changing jobs is not easy. The employer power basically stems from labour market frictions. There are real world frictions such as financial and emotional costs of changing jobs in an unstable market, geographical constraints, lack of transparency and information asymmetry. During the Covid time more people took up to working remote and working online. This too could have been a source of power for the employer. Since these frictions exist, and if the employer wants to attract more workers, they have to raise wages. However, when the external friction persists, the employer power also increases. More remote work opportunities mean over time, the employer cannot keep up the remote wage discount, and consequently they can afford to suppress wages below a worker's actual marginal revenue product without losing their entire workforce. The remote wage discount need not exist in such a case, because if there is more demand for the job, the employer ends up having more power.

H2 (monopsony): The remote wage discount shrinks as the share of remote postings in an occupation rises.

4. DATA AND METHODOLOGY

4.1 Data

Table 1 summarizes the key datasets and variables for analyzing whether the expansion of remote-work opportunities is associated with changes in the relative wages of remote workers. The operationalization of variable, its role in hypothesis, source (WFH Map data, ACS data from IPUMS USA, and others) and unit of measurement is identified in the below table. provide worker-level wage and demographic information.

Table -1: Dataset and variables

Variable	Source	Unit	Role and connection to hypotheses
Remote posting share	WFH Map	% of postings	Measures the availability of remote employment opportunities within each occupation and forms the treatment/intensity variable. A larger increase in remote postings provides a stronger test of H2 (Manning).
Remote-work wage	ACS, IPUMS USA	Real US\$/hour	Measures the hourly earnings of workers who work remotely. It is combined with the non-remote wage to determine whether the relative wage position of remote workers changes as remote opportunities expand, providing the outcome needed to distinguish between H1 and H2.
Non-remote wage	ACS, IPUMS USA	Real US\$/hour	Provides the comparison wage for workers who are not remote. The difference between remote and non-remote wages forms the remote wage differential.
Remote wage differential	Calculated from ACS data	%	Main dependent variable. Measures the percentage difference between remote and non-remote wages. If the differential becomes more favourable to remote workers as remote opportunities expand, this supports H2 (Manning); if it remains relatively stable, this is more consistent with H1 (Rosen).
Occupation	ACS/IPUMS USA + WFH Map	SOC code	Links workers' wage outcomes to the occupation-level expansion in remote job opportunities.
State	ACS/IPUMS USA	State	Controls for geographical differences in wages and labour-market conditions.
Year	ACS/IPUMS USA + WFH Map	Year	Establishes the time dimension of the analysis and allows wage differentials to be compared across periods.
Month	WFH Map	Month	Provides monthly variation in remote job postings and helps measure changes in the availability of remote opportunities over time. The data strengthens the measurement of the treatment variable.
Education	ACS/IPUMS USA	Years/category	Controls for differences in educational attainment between workers. This is important because education can affect wages independently of remote-work status, potentially confounding the estimated wage differential.
Experience/age	ACS/IPUMS USA	Years	Controls for differences in labour-market experience that may affect earnings.
Sex	ACS/IPUMS USA	Category	Controls for demographic differences associated with wage outcomes.
Hours worked	ACS/IPUMS USA	Hours/week	Controls for differences in working hours when comparing hourly wages.

Table 2 uses occupation-level job-posting data from WFH map, from the work of Hansen et al. (2023), whose research examined more than 500 million vacancy postings across five English-speaking countries, with this table reflecting the US occupation level data. Basically, the table of data measures the percentage of new job postings that offer at least one day of remote work per week. The figures will support the measure of the expansion of available remote employment opportunities and therefore provide the treatment/intensity measure used to test H2 (Manning) against H1 (Rosen).

Table -2: Remote Job Expansion Table (Hansen et al., 2023)

Occupation group	Pre-COVID remote postings	Post-COVID remote postings	Approx. increase
Transportation & material moving	0.5%	1.0%	+0.5 pp
Production	1.0%	3.0%	+2.0 pp
Installation, maintenance & repair	1.5%	2.5%	+1.0 pp
Construction & extraction	1.5%	2.5%	+1.0 pp
Farming, fishing & forestry	2.0%	2.5%	+0.5 pp
Office & administrative support	3.0%	10.0%	+7.0 pp
Sales & related	5.0%	9.0%	+4.0 pp
Personal care & service	1.0%	2.5%	+1.5 pp
Building & grounds cleaning	0.5%	1.0%	+0.5 pp
Food preparation & serving	0.5%	0.8%	+0.3 pp
Protective service	2.5%	4.0%	+1.5 pp
Healthcare support	1.0%	1.5%	+0.5 pp
Healthcare practitioners & technical	2.0%	2.5%	+0.5 pp
Arts, design, entertainment, sports & media	4.0%	12.0%	+8.0 pp
Education, training & library	3.0%	5.0%	+2.0 pp
Legal	6.0%	23.0%	+17.0 pp
Community & social service	4.0%	12.0%	+8.0 pp
Life, physical & social science	4.0%	12.0%	+8.0 pp
Architecture & engineering	2.5%	12.0%	+9.5 pp
Computer & mathematical	6.0%	29.0%	+23.0 pp
Business & financial operations	6.0%	23.0%	+17.0 pp
Management	4.0%	13.0%	+9.0 pp

Before conducting the analysis, summary statistics were calculated in Microsoft Excel for the numerical variables presented in Tables 2 to 5. These include the mean, median, range and number of observations (N). The statistics provide a summary of the distribution of the variables before the subsequent analysis.

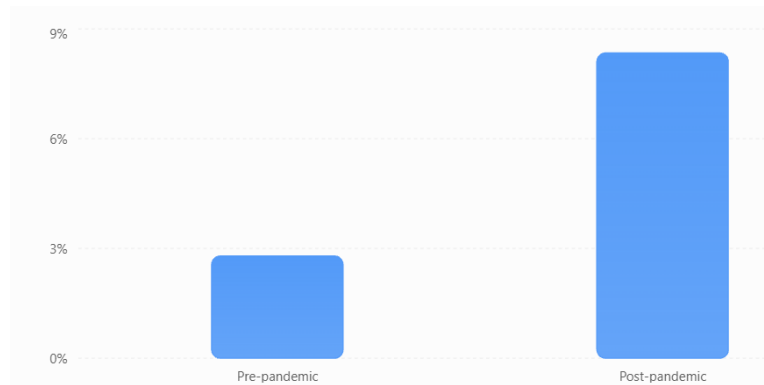


Chart -1: Comparison of Mean and Median Remote Job-Posting Shares Before and After the Pandemic

For Table 2-Chart 1, the 22 occupation groups have a mean pre-pandemic remote-posting share of 2.80%, a median of 2.50%, and a range of 5.50 percentage points (0.50%-6.00%). The post pandemic changes to a mean of 8.35%, a median of 4.50%, and a range of 28.20 percentage points (0.80%-29.00%).

Table 3 (below) covers the occupation-level WFH Map data, covering U.S. occupations classified using SOC codes, with work-from home share measured as the percentage of job postings offering remote or hybrid work. The variables are occupation, SOC code, WFH share 2017–19, WFH share 2023–26, and change in percentage points. The change variable is calculated as the post-period WFH share minus the pre-period WFH share, with positive values indicating greater expansion in remote opportunities. Occupations are distinguished here based on the intensity of remote work expansion.

Table -3: Expansion in Remote Job Opportunities (Hansen et al., 2023)

Occupation	SOC code	WFH share 2017–19 (%)	WFH share 2023–26 (%)	Change (percentage points)
Actuaries	15-2011	6.73	60.47	+53.74
Administrative Law Judges, Adjudicators & Hearing Officers	23-1021	7.76	47.85	+40.09
Financial Examiners	13-2061	12.63	47.20	+34.57
Insurance Underwriters	13-2053	11.46	45.26	+33.80
Insurance Claims & Policy Processing Clerks	43-9041	7.19	40.70	+33.51
Proofreaders & Copy Markers	43-9081	6.43	39.24	+32.81
Mathematicians	15-2021	2.50	32.83	+30.33
Editors	27-3041	7.14	37.23	+30.09
Political Scientists	19-3094	9.87	39.58	+29.71
Web Developers	15-1254	7.70	36.76	+29.06
Audiovisual Equipment Installers & Repairers	49-2097	26.65	5.92	–20.73
Brickmasons & Blockmasons	47-2021	13.40	1.85	–11.55
Hydrologic Technicians	19-4044	46.88	35.69	–11.19
Wind Turbine Service Technicians	49-9081	19.70	13.57	–6.13
Musical Instrument Repairers & Tuners	49-9063	6.15	0.15	–6.00
Private Detectives & Investigators	33-9021	20.47	14.59	–5.88
Police & Sheriff's Patrol Officers	33-3051	7.36	2.68	–4.68
Bridge & Lock Tenders	53-6011	4.59	0.95	–3.64
Secondary School Teachers	25-2031	6.31	3.24	–3.07
Transportation Security Screeners	33-9093	26.28	23.43	–2.85

For Table 3, the 20 occupations have a mean WFH share of 12.86% for 2017-2019, with a median of 7.73% and a range of 44.38 percentage points (2.50%-46.88%). Post pandemic, for the years of 2023-2026, the mean WFH share is 26.46%, the median is 34.26%, and the range is 60.32 percentage points (0.15%-60.47%).

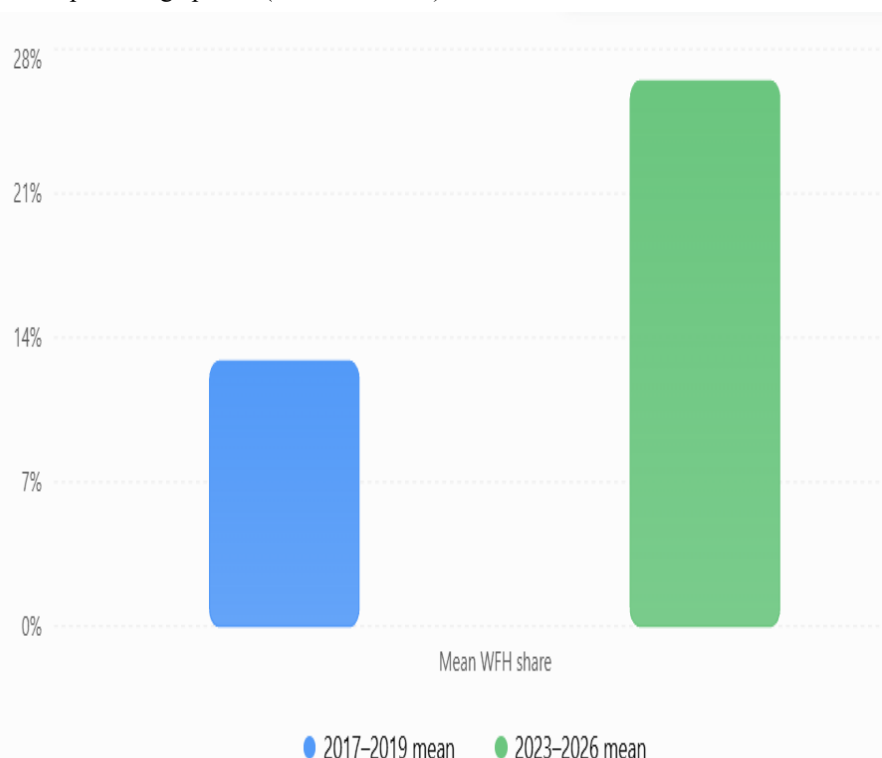


Chart -2: Mean WFH Share Before and After the Pandemic

Table 4 uses the *U.S. Bureau of Labor Statistics (BLS) Occupational Employment and Wage Statistics (OEWS)*, May 2025, covering the United States, including the 50 states and District of Columbia. The variable shown is annual mean wage, measured in U.S. dollars per year, for selected large occupations. The figures are nominal 2025 dollar values and no cross-year inflation adjustment is required.

Table -4: Annual Mean wages of Largest US Occupations

Occupation	Annual mean wage (US\$)
General and operations managers	\$134,940
Registered nurses	\$101,420
All occupations	\$69,770
Customer service representatives	\$46,590
Office clerks, general	\$46,420
Laborers and freight, stock, and material movers, hand	\$42,260
Stockers and order fillers	\$39,540
Retail salespersons	\$37,310
Home health and personal care aides	\$36,120
Cashiers	\$33,180
Fast food and counter workers	\$32,150

For Table 4, there are 11 selected occupations, and the mean annual wage is \$56,336.36, a median of \$42,260, and a range of \$102,790, from \$32,150 to \$134,940.

Table 5 uses the American Community Survey (ACS) data analysed by Pabilonia and Vernon, whose study makes use of ACS data from 2010–2021, extracted through IPUMS USA. Remote workers are identified using the ACS work-from-home response. Wages are expressed in real U.S. dollars, with nominal earnings converted using the Consumer Price Index for All Urban Consumers (CPI-U).

Table -5: Real Hourly Wages of Remote and On-Site Workers, 2010–2022 (Pabilonia, & Vernon, 2023).

Year	On-site real hourly wage (2021 US\$)	Remote real hourly wage (2021 US\$)	Remote wage differential
2010	\$28.232	\$36.541	+29.43%
2019	\$29.259	\$39.243	+34.14%
2021	\$28.501	\$42.457	+48.97%
2022	\$28.122	\$44.064	+56.69%

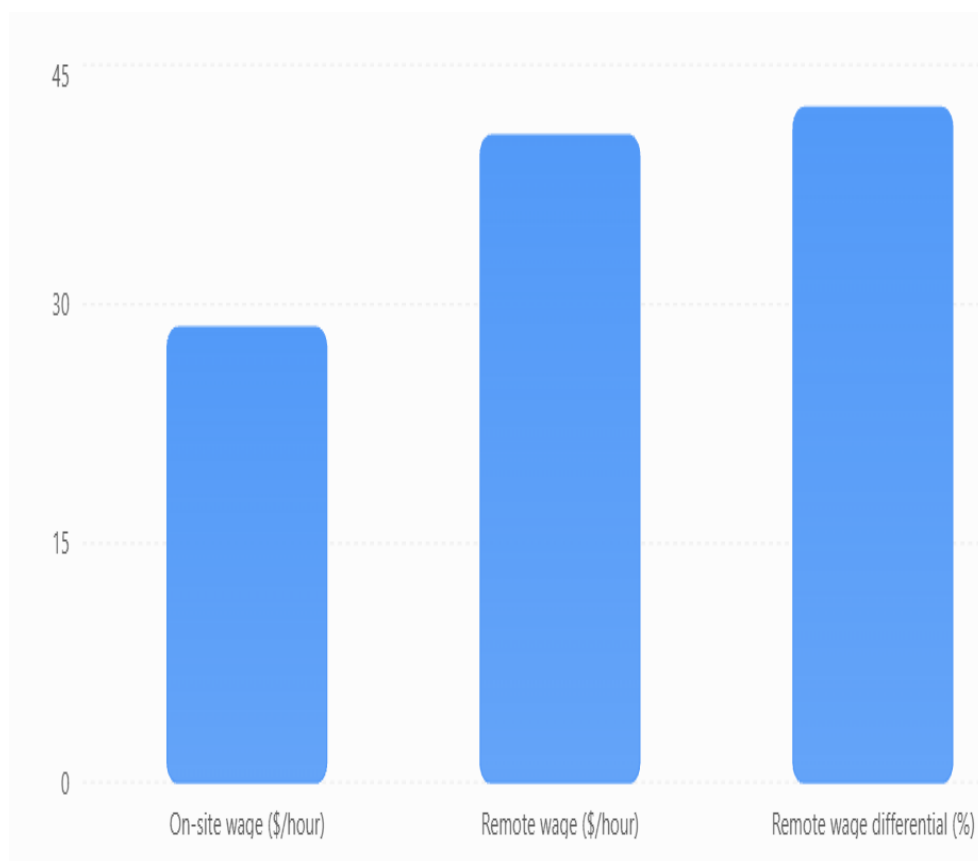


Chart -3: Mean Real Hourly Wages and Remote Wage Differential

For Table 5, the four annual observations have a mean on-site real hourly wage of \$28.529, a median of \$28.367, and a range of \$1.137, from \$28.122 to \$29.259. The mean remote real hourly wage is \$40.576, with a median of \$40.850 and a range of \$7.523, from \$36.541 to \$44.064. The remote wage differential has a mean of 42.31%, a median of 41.56%, and a range of 27.26 percentage points, from 29.43% to 56.69%.

Table -6: Adjusted Remote–On-Site Wage Differentials by Major Occupation, 2021 (Pabilonia, & Vernon, 2024)

Occupation group	Remote-job expansion	2019 wage differential	2021 wage differential*	Change
High-expansion occupations				
Sales & related	+4.00 pp	11.0%	20.8%	+9.8 pp
Management	+9.00 pp	9.0%	16.8%	+7.8 pp
Production	+2.00 pp	9.0%	14.7%	+5.7 pp
Arts/design/media	+8.00 pp	8.0%	14.6%	+6.6 pp
Business operations	+17.00 pp	8.5%	14.0%	+5.5 pp
Life/physical/social science	+8.00 pp	8.0%	13.9%	+5.9 pp
Legal	+17.00 pp	7.5%	13.4%	+5.9 pp
Computer & mathematical	+23.00 pp	7.0%	13.1%	+6.1 pp
Architecture & engineering	+9.50 pp	7.5%	12.9%	+5.4 pp
Office/admin support	+7.00 pp	8.0%	12.5%	+4.5 pp
Mean high-expansion	+10.75 pp	8.25%	14.87%	+6.62 pp
Low-expansion occupations				
Protective service	+1.50 pp	8.0%	12.4%	+4.4 pp
Education/library	+2.00 pp	7.5%	9.3%	+1.8 pp
Personal care/service	+1.50 pp	5.0%	6.3%	+1.3 pp
Community/social service	+8.00 pp	5.0%	5.4%	+0.4 pp
Transportation/material moving	+0.50 pp	4.0%	4.9%	+0.9 pp
Construction/extraction	+1.00 pp	4.0%	4.6%	+0.6 pp
Installation/maintenance/repair	+1.00 pp	3.0%	3.4%	+0.4 pp
Food preparation/serving	+0.30 pp	2.0%	2.3%	+0.3 pp
Healthcare practitioners/technical	+0.50 pp	1.0%	1.0%	0.0 pp
Building/grounds maintenance	+0.50 pp	0.5%	0.9%	+0.4 pp
Mean low-expansion	+1.63 pp	4.00%	5.05%	+1.05 pp

4.2 Methodology

The conceptual worker level specification is something of,

$$\ln(Wage_{iot}) = \beta_0 + \beta_1 Remote_{iot} + \beta_2 (Remote_{iot} \times RemoteShare_{ot}) + \gamma X_{iot} + \delta_0 + \lambda_t + \epsilon_{iot}$$

where,

- $Wage_{iot}$ is the real hourly worker wage of worker i in an occupation o at time t
- β_2 is the coefficient of primary interest, as a positive value will indicate that the wage position of remote workers becomes more favorable as remote employment opportunities expand and this is consistent with H2 (Mannings). On the other hand, if this variable is 0, then this indicates the wage differential remains relatively stable despite the expansion of remote opportunities, and this is more consistent with H1(Rosens).
- $Remote_{iot}$ when equal to 1 means that the worker works remotely, and 0 otherwise
- $Remote_{iot} \times RemoteShare_{ot}$ is basically the interaction between remote worker status and the availability of remote jobs.
- X_{iot} is the worker-level controls including the education, age/experience, gender and hours worked.
- δ_0 is the occupation effects
- λ_t is the time effects.
- ϵ_{iot} is the error term.

The conceptual worker-level specification is presented to describe the intended empirical relationship between remote-work status, remote-job availability, and wages, but it is not directly estimated because the available data do not provide consistent worker-level observations across the required periods. Therefore, the analysis uses the occupation-level difference-in-differences framework as the primary empirical approach.

4.2.1 Empirical Blueprint: Difference-in-Differences Across Occupations

The dependent variable in the empirical framework is the remote work differential given as,

$$W D_{ot} = \frac{W_{ot}^{Remote} - W_{ot}^{On-site}}{W_{ot}^{On-site}} \times 100$$

The treatment variable, is the change in availability of remote employment opportunities, given as,

$$RemoteExpansion_0 = RemoteShare_{post,o} - RemoteShare_{pre,o}$$

4.2.2 Differences-in-differences formulation

For the occupation level comparison, the change in the remote wage differential is represented as,

$$DiD = (W D_{High,Post} - W D_{High,Pre}) - (W D_{Low,Post} - W D_{Low,Pre})$$

Here, $W D$ represents the remote wage differential.

It is expected that the high expansion occupations will be those that experience large increase in job postings, relative to low expansions. Therefore, a positive DiD value means that the wage position of remote workers improved relatively better than that of those in occupations with greater expansion in remote opportunities, this proving H2.

5. RESULTS

This study makes use of a difference-in-differences (DiD) framework for investigating whether the expansion of remote employment opportunities changes the relative wages of remote workers. The identification strategy compares occupations experiencing different levels of growth in remote job postings before and after the expansion of remote work.

The underlying strategy and logic here is that only the occupations with a higher rate of remote growth can provide workers with more potential outside employers, because only if the employer monopsony power contributes to lower remote wages, then the remote wage differential will become favorable to remote workers, when opportunities expand. However, in contrast, with the differential representing the compensating differential for desired flexibility of work then wage differential should be relatively stable.

5.1 Expansion of Remote Work Opportunities

The WFH map data shows that substantial variation in expansion of remote work opportunities across occupations. The selected high expansion occupations in remote and hybrid increased by 10.75 percentage points, while low expansion occupations increased by only 1.63 percentage points.

This difference is pertinent to the investigation because occupations that experience greater growth are providing workers with more alternative employers, and thus is relevant for proving Manning's hypothesis.

The variations are particularly evidence in computer and mathematical occupations, business, legal and financial operations, as opposed to food preparation, construction, transportation and maintenance.

Table -7

Occupation group	Expansion (pp)	Finding
High-expansion occupations	+10.75	Remote opportunities expanded substantially, creating a larger potential pool of alternative employers.
Low-expansion occupations	+1.63	Remote opportunities expanded much less, implying a smaller increase in workers outside options.
Difference between groups	+9.12 pp	High-expansion occupations experienced 9.12 pp more growth in remote opportunities than low-expansion occupations.

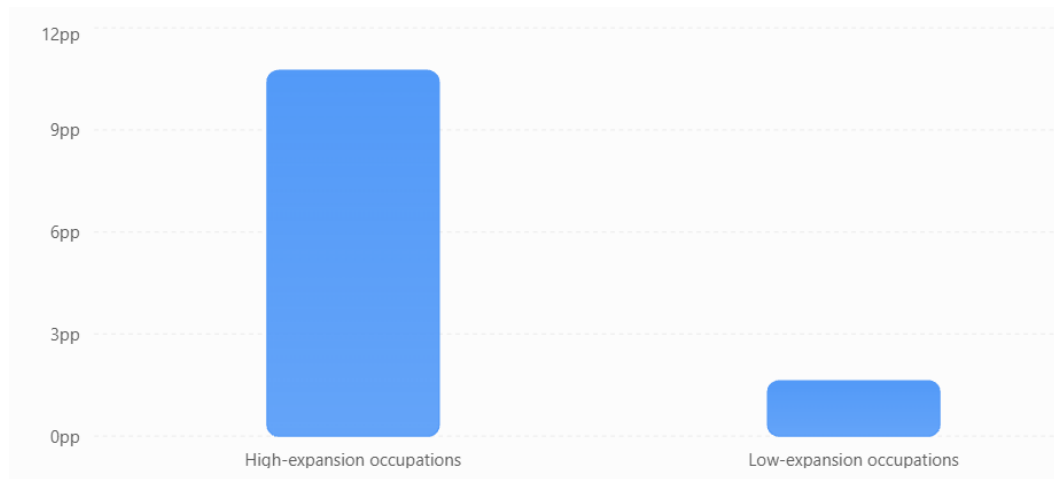


Chart -4: Expansion in remote work opportunities by occupation group

5.2 Changes in the remote work wage differential

$$W D_{ot} = \frac{W_{ot}^{Remote} - W_{ot}^{On-site}}{W_{ot}^{On-site}} \times 100$$

For example, with 2019 aggregate data from Table 5, the remote worker wage is \$39.243/hour, and the on-site worker wage is \$29.259/hour.

$$\begin{aligned}
 W D_{2019} &= \frac{39.243 - 29.259}{29.259} \times 100 \\
 &= \frac{9.984}{29.259} \times 100 = 34.14\%
 \end{aligned}$$

For 2021,

$$W D_{2019} = \frac{42.457 - 28.501}{28.501} \times 100 = 48.97\%$$

The aggregate remote-work wage differential increased by, $48.97 - 34.14 = 14.83$ percentage points, indicating that the relative wage position of remote workers became more favorable between 2019 and 2021.

Table -8: Remote-Work Wage Differential

Year	Remote wage (\$/hour)	On-site wage (\$/hour)	Wage difference (\$/hour)	Remote wage differential
2019	39.243	29.259	9.984	34.14%
2021	42.457	28.501	13.956	48.97%
Change	+3.214	-0.758	+3.972	+14.83 pp

Table -9

Occupation	2021 adjusted remote wage differential	Interpretation
Sales and related	20.8%	Remote workers had substantially higher adjusted wages than on-site workers.
Management	16.8%	A relatively large positive remote wage differential was observed.
Production	14.7%	Remote workers had a positive wage differential.
Arts, design, entertainment, sports & media	14.6%	A sizeable positive differential was observed.
Business operations specialists	14.0%	Remote work was associated with a positive wage differential.
Life, physical & social science	13.9%	A relatively large positive differential was observed.
Legal	13.4%	Remote workers had higher adjusted wages.
Computer & mathematical	13.1%	A positive differential was observed despite substantial variation in remote-job expansion.
Architecture & engineering	12.9%	Remote workers had a positive adjusted wage differential.
Office & administrative support	12.5%	A positive differential was observed.
Protective service	12.4%	Remote workers had higher adjusted wages.
Educational instruction & library	9.3%	The positive differential was smaller than in the highest groups.
Financial specialists	9.0%	A moderate positive differential was observed.
Personal care & service	6.3%	The wage advantage was relatively small.
Community & social service	5.4%	A modest positive differential was observed.
Transportation & material moving	4.9%	The differential was positive but comparatively small.
Construction & extraction	4.6%	A small positive differential was observed.
Installation, maintenance & repair	3.4%	The remote wage advantage was limited.
Food preparation & serving	2.3%	Only a small positive differential was observed.
Healthcare practitioners & technical	1.0%	The adjusted differential was close to zero.
Building & grounds cleaning & maintenance	0.9%	Very little wage difference was observed.
Healthcare support	-5.5%	Remote workers had a lower adjusted wage than on-site workers.

Remote workers on an average received higher hourly wages than on-site workers in the observed period, and in the aggregate data, the raw remote-work wage differential increased from 34.14% in 2019 to 48.97% in 2021, an increase of 14.83 percentage points.

Occupation level data shows variations around the overall pattern, with 2021 adjusted remote work differential larger in work like sales, management, production and arts. Healthcare support only has a negative differential (-5.5%).

5.3 Remote Work Expansion

$$RemoteExpansion_0 = RemoteShare_{post,0} - RemoteShare_{pre,0}$$

For instance, from the data, the computer and mathematical occupations experienced an increase from an approximate 6% to 29%. So, the

$$\begin{aligned} RemoteExpansion_{computer} &= 29 - 6 \\ &= 23 \text{ percentage points} \end{aligned}$$

In comparison, others like transportation and mover occupations increased from 0.5% to 1%, so,

$$\begin{aligned} RemoteExpansion_{transport} &= 1.0 - 0.5 \\ &= 0.5 \text{ percentage points} \end{aligned}$$

Table -10

Occupation	Pre-expansion share	Post-expansion share	Remote expansion
Computer & mathematical	6.0%	29.0%	+23.0 pp
Business & financial operations	6.0%	23.0%	+17.0 pp
Legal	6.0%	23.0%	+17.0 pp
Architecture & engineering	2.5%	12.0%	+9.5 pp
Management	4.0%	13.0%	+9.0 pp
Arts/design/entertainment/sports/media	4.0%	12.0%	+8.0 pp
Life/physical/social science	4.0%	12.0%	+8.0 pp
Office & administrative support	3.0%	10.0%	+7.0 pp
Sales	5.0%	9.0%	+4.0 pp
Transportation & material moving	0.5%	1.0%	+0.5 pp

5.4 Difference-in-differences

$$DiD = (W D_{High,Post} - W D_{High,Pre}) - (W D_{Low,Post} - W D_{Low,Pre})$$

$$DiD = \Delta W D_{High} - \Delta W D_{Low}$$

Using the occupation level values,

For high expansion occupations,

- $W D_{High,Post} = 14.87\%$
- $W D_{High,Pre} = 8.25\%$

Therefore,

$$\Delta W D_{High} = 14.87 - 8.25$$

$$\Delta W D_{High} = 6.62pp$$

For low expansion occupations

- $W D_{Low,Pre} = 4\%$
- $W D_{Low,Post} = 5.05\%$

Therefore,

$$\Delta W D_{Low} = 5.05 - 4.00$$

$$\Delta W D_{Low} = 1.05pp$$

Then,

$$DiD = 6.62 - 1.05$$

$$= +5.57 \text{ percentage points}$$

The +5.57 percentage-point DiD in the result means that the remote work wage differential increased by an approximate 5.57 percentage points more in occupations that experienced greater expansions in remote employment, as compared to employments with little expansions. The result therefore provides support for H2(Manning). When employers possess monopsony power, then an increase in the number of alternative remote employers will weaken that power and improve worker's relative wages, but the continued increase will reduce wage-discount benefits for remote jobs. On the contrast H1(Rosens) which predicts that the wage differential should remain relatively stable because the worker willingly participates to exchange their wages for amenities irrespective of increasing remote job opportunities is not supported.

Table -11: Hypothesis Test Summary

Hypothesis	Prediction	Result	Assessment
H1 (Compensating differentials)	The remote wage discount stays roughly constant regardless of how common remote jobs are in an occupation.	The wage differential increased by 6.62 pp in high-expansion occupations compared with 1.05 pp in low-expansion occupations. The DiD was +5.57 pp.	Not supported
H2 (Monopsony)	The remote wage discount shrinks as the share of remote postings in an occupation rises.	The high-expansion group experienced a larger increase in the positive remote wage differential, rather than a reduction in a negative wage discount.	Somewhat supported but not directly

6. DISCUSSION AND LIMITATIONS

The findings from DiD +5.57 percentage points provides some support for H2 as the relative wage position of remote workers improved more strongly in occupations experiencing greater expansion in remote opportunities. While H2 is not directly demonstrated because the calculated wage differentials are positive rather than negative. The remote wage discount shrinks as the share of remote postings in an occupation rises, is the H2, and the results showed the relative wage position of remote workers improved more strongly where remote opportunities expanded more, so the result is consistent with economic mechanism

underlying H2. The results therefore provide some support for H2 (monopsony). The findings are consistent with the mechanism underlying H2. The DiD shows that the relative wage position of remote workers improved more strongly in high-expansion occupations. This is consistent with the monopsony mechanism underlying H2, but it does not directly test the specific prediction that a negative remote wage discount shrinks.

6.1 Comparison with previous literature

The findings of the study are generally consistent with Manning's (2003) monopsony framework, that suggests employers have better wage-setting power. When remote employment opportunities increase then workers might have more alternative options and can perhaps increase workers bargaining powers, but with increasing jobs the remote wage discounts might not be sustained. The data shows the mechanism of monopsony is correct for the data, but the data itself might be too limited, and perhaps this is why the reduction in wage discounts are not clearly supported.

The findings also broadly agree with Pabilonia and Vernon (2024), who identify substantial variation in remote-work wage differentials across occupations. Their results showed positive adjusted wage differentials in occupations such as sales and management having positive differential and health care having a negative differential.

The findings are not so consistent with Rosen (1986) on compensating differentials. If the wage differential primarily reflects workers' willingness to exchange wages for the non-monetary benefit of flexibility, the differential should remain relatively stable as remote work becomes more widely available. The larger change observed shows this is not the case.

6.2 Limitations

Measuring Outside Options: The WFH Map data measures the share of job postings offered in the case of remote and hybrid work, as opposed to other alternative employment offered for individual workers. An increase in remote postings, and WFH does not necessarily reduce alternative options. So, some measurement noise might be introduced in the treatment variables.

Worker Composition: Remote and on-site characteristics might not have the same capabilities and will differ in terms of education, experience, occupation and other characteristics that independently affect wages. This can therefore negotiate better for wage discounts or lesser, and this might not acutely reflect differences in worker composition, creating a potential variable omitted bias.

Different Measures of Remote Work: Datasets might measure remote work differently. The WFH Map measures the proportion of job postings offering remote or hybrid work, while the ACS identifies workers according to whether they worked from home. This also introduces some measurement noise.

6.3 Policy Implications

The findings suggest that increasing workers access to alternative remote employers will strength the bargaining position of the employees, while reducing employers ability to maintain unfavorable wage differentials. Results show that remote workers are not at such a point where they are exploited by their employers, and in fact they are not underpaid. The greater competition between employers for remote workers may improve workers' relative wage positions, particularly in occupations where remote employment can expand substantially and hence H2 is partially supported. However, the relatively short period examined may not capture the longer-term development of employer power in the remote labour market. As remote work becomes more established and employers adjust their wage-setting strategies over time, the relationship between remote-job availability and wages may change, potentially resulting in smaller remote wage discounts in the longer run. Therefore, the current findings should not be interpreted as ruling out the wage-discount effect predicted by H2 over a longer period.

7. CONCLUSION

The aim of this paper is to determine whether the wage discount associated with remote work changes as remote job opportunities expand within occupations, and to assess whether the observed relationship is more consistent with Rosen's theory of compensating differentials or Manning's model of employer monopsony power, using a difference-in-differences approach.

Hypothesis H1: The remote wage discount stays roughly constant regardless of how common remote jobs are in an occupation. H1 is not supported by the findings. The high-expansion group experienced a 6.62 percentage-point increase, compared with only 1.05 percentage points in the low-expansion group, producing a +5.57 percentage-point DiD. Therefore, the relative wage position of remote workers did not remain stable as remote opportunities expanded, providing evidence against the prediction of H1.

Hypothesis H2: The remote wage discount shrinks as the share of remote postings in an occupation rises. The +5.57 percentage-point DiD shows that the relative wage position of remote workers improved more strongly in occupations with greater expansion in remote opportunities, which is consistent with this underlying monopsony mechanism. However, since the observed wage differentials are positive rather than negative, H2 is not fully proven.

Overall, the analysis suggests that the expansion of remote employment opportunities is associated with a more favourable relative wage position for remote workers, particularly in occupations where remote opportunities expanded substantially

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