Re-evaluating the urban wage premium: the changing roles of geographical and job transitions for women and men[1,2]

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Re-evaluating the urban wage premium: the changing roles of geographical and job transitions for women and men[1][2]

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Abstract

This paper investigates gender as a new source of heterogeneity in the urban wage premium, using a representative panel of 1.2 million worker observations in Great Britain over the period 1999-2019. Pre-2008, women's urban wage premium was more than twice as large as men's (2.8% versus 1.2%), but this difference disappears during the Financial Crisis as women's urban wage premium drastically and permanently drops. This drop is due to the disappearance of women's relative sharing advantages. Moreover, contrary to men, women's urban wage premium is now driven by a wage penalty incurred when changing occupation while transitioning from urban to rural jobs.

Keywords

Urban wage premium; agglomeration economies; cities.

JEL codes: R23; J31.

Declarations of interest: none.

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I. Introduction

Workers earn more in cities than in rural locations (all other things equal) and this wage premium tends to increase with city size. Estimates of the urban wage premium are available for a number of countries yet vary widely.[3] In Britain, it has been estimated at 2.3%, going up to 7.1% in London (D'Costa and Overman, 2014). At the same time, the well-known wage gap between men and women in full-time employment, although declining, remains high, currently at 7.7% in the UK (ONS, 2023). Eliminating the gender wage gap is at the forefront of the policy agenda, for equity reasons first but also because it is seen as a loss in national welfare. Given the evidence on the wage advantages of cities, what remains unknown is whether cities can play a role in reducing the gender wage gap. Answering this question requires a comparison of the relative wage premium of working in cities for men and women as well as an understanding of the economic mechanisms that underlie the urban wage premium for women.

This paper reveals that women's urban wage premium in Great Britain was more than twice as large as men's pre-2008 (2.8% versus 1.2%[4]), but that since the Financial Crisis, there is no statistically significant gender difference in urban wage premium. Women's urban wage premium drastically dropped to the same level as men's during the Financial Crisis (1.4% in the period 2008-2013) and remained unchanged in the recovery period (post-2014). In contrast, there were no significant changes in estimates for men over time.

The analysis shows that three mechanisms explain women's relative urban wage premium: sorting on unobserved ability into cities, sharing advantages in cities that make workers more productive there and occupational matching during urban-to-rural job transitions. I find that the higher urban wage premium for women pre-crisis was due to a combination of lower sorting into cities for women than for men, a large wage growth penalty suffered by women (but not by men) when they changed occupations at the same time when they transitioned from urban to rural jobs and to women (but not men) benefiting from sharing in cities. Next, the large drop in women's relative urban wage premium since the Financial Crisis is explained by the fact that women no longer benefit from the sharing mechanism.

[3] For example, Combes *et al. (*2008) find the elasticity of wages with respect to employment density in France is 3%; Di Addario and Patacchini (2008) find that earnings in Italy increase by 0.1% for every additional 100,000 inhabitants; Glaeser and Maré (2001) obtain an urban wage premium for big cities in the USA of 4.5% or 11% depending on the dataset used.

[4] The difference in estimates is statistically significant at the 1% level.

The results highlight that despite similar urban wage premia, the nature of the urban wage premium and what drives wage growth during urban-rural job transitions are different for women and men. In the recovery period, women still experience a wage penalty when they move from an urban to a rural job which is associated with changing occupation, whilst for men urban-rural job transitions in either direction increase wage growth. Furthermore, I find that in the recovery period, the observed wage growth patterns for men and women are consistent with the average changes in employer quality during in- and out-city job transitions. Whilst men experience employer quality upgrades in both directions, women tend to experience an employer quality downgrade when they switch to a rural job.

There are several reasons to expect systematic differences in the *magnitude* of the urban wage premium between genders, even for comparable jobs and workers. These arguments will be developed in the next section and include gender differences in agglomeration economies as well as gender differences in sorting on ability into urban jobs, in selection into work based on observed characteristics, in selection into occupations and industries, gender and urban-rural differences in hours worked and commuting patterns and urban-rural differences in labour market gender discrimination. Gender is therefore a new, important source of heterogeneity in the urban wage premium that has received relatively little attention in the urban economics literature. In contrast, there is good evidence on other sources of heterogeneity: agglomeration gains are stronger for manufacturing industries than services (Melo and Graham, 2009), for more educated workers than for less educated ones (Autor, 2019; Baum Snow *et al.*, 2018; Di Addario and Patacchini, 2008; Lindley and Machin, 2014), for higher earners than for lower earners (Matano and Naticchioni, 2012) and they seem to exist for white collar-workers but not for blue-collar workers (Gould, 2007).

Beyond measuring if the urban wage premium differs between genders, testing the theoretical mechanisms underlying the difference matters, because these mechanisms have different implications for public policy. For example, if women's urban wage premium comes from particularly high productivity improvements for them in cities, this would call for measures enabling women to work in cities, including: childcare, transport and housing policy interventions; labour market interventions such as coaching, networking and employment support; or employer-level action where for example, multi-plant employers facilitate job changes for women towards cities. But if cities are simply *attracting* the most productive women, such policies would be ineffective for women and place-based, rural policies would be more appropriate. Ascertaining what drives women's urban wage premium can therefore

help single out specific new ways of enhancing women's wages and reducing the gender pay gap.

Recent research into the causes of the gender pay gap includes gender differences in bargaining (Card *et al.*, 2016) and in the sorting of workers across firms with different pay premia (Jewell *et al.*, 2020), in promotion seeking (Bosquet *et al.*, 2019) and the role of fertility, career interruptions and cumulative work experience (Adda *et al.*, 2017; Costa Dias *et al.*, 2020). Geographical variations in the gender pay gap is still a relatively less studied dimension of this problem. There is cross-sectional evidence for the USA (Bacolod, 2017) that the gender pay gap decreases in metropolitan area size. For Germany, Hirsch *et al.* (2013) link the urban-rural difference in the gender pay gap to differences in employer market power and discrimination and Fuchs *et al.* (2021) provide cross-sectional evidence that the very wide regional differences in gender pay gap are mostly driven by men's labour market conditions at the regional level.

I use a large, representative panel of workers in Great Britain covering the years 1999-2019, based on the ASHE/NES employer survey that samples one percent of workers, offering a unique opportunity to study wages and job transitions across locations, occupations and industries. The geographical unit of analysis is Travel-To-Work-Areas (TTWA), pre-determined labour markets in which most people both live and work. Workplace TTWAs are categorised as either rural or urban according to their employment size. The source of variation for the estimation of the urban wage premium with worker fixed effects is workers transitioning between an urban and a rural TTWA at least once in any direction.

In order to explain the pre-crisis gender gap in urban wage premium, this paper contributes to the new literature on *occupational matching* in cities (Koster and Ozgen, 2021; Papageorgiou, 2022) by implementing a novel fixed-effects strategy that allows to dissect the urban wage premium into the premium estimated off urban-rural job movers and a wage premium due to the urban job also being in a different occupation, industry or part or full-time status. As a result, the urban wage premium can be related to these three different types of job changes. My results reveal that prior to the Financial Crisis, workers having changed occupation at the same time when they transitioned between a rural job and an urban job in either direction accounted for 13% of women's urban wage premium.

Further, I first difference the static model of the urban wage premium to obtain a model estimating the effects of remaining in a city, transitioning to a city job and transitioning to a rural job on yearly wage growth. I find that prior to the Financial Crisis, women experienced a wage growth penalty as they switched from an urban job to a rural job, rather than greater

benefits than men when moving from a rural job *into* an urban job. The greater measured static urban wage premium was due to wage drops when leaving an urban job rather than wage increases when joining one or to faster wage growth within an urban labour market. This wage growth model also provides evidence on the role of the sharing mechanism in the relative urban wage premium for women versus men over time. For women, there are large and symmetric coefficients measuring the effects of transitioning into and out of an urban job before 2008, which goes away during the crisis: This identifies relative sharing externalities enjoyed by women which have gone away during the Financial Crisis.

This paper is, to my knowledge, the first to focus on estimating gender differences in the urban wage premium over time using a large representative panel of workers recording personal and job characteristics as well as their labour market transitions and to explain the differences in light of existing theory. So far, almost all existing estimates of the urban wage premium ignore the gender dimension. Most use data on male workers, starting from the seminal work in Glaeser and Maré (2001) to more recent contributions exploring the sources of the urban wage premium: D'Costa and Overman (2014), De la Roca and Puga (2017), Hirsch *et al.* (2022), Porcher *et al.* (2023). This has been the case historically for practical reasons, due to the traditional determinants of labour force participation, labour mobility patterns and wages being different between genders and not always observable or available in datasets. A smaller strand of the empirical literature pools both genders, notably Carlsen *et al.* (2016), Combes *et al.* (2008), Di Addario and Patacchini (2008) and Melo and Graham (2009).

Few exceptions estimate the urban wage premium separately for men and women. In unpublished robustness checks, D'Costa and Overman (2014) find that in Britain in the period 1998-2007 the urban wage premium is greater for women whilst De la Roca and Puga (2017) find the opposite in Spanish data, albeit with a strong caveat about low Spanish female labour force participation.[5] Duranton (2016) finds that the effect of city size on wages is the same for men and women in Colombia between 1996 and 2012. Two current investigations into the productivity advantages of cities deliver mixed results on whether these may be higher for women (see Ahlfeldt *et al.*, 2021 for Germany) or similar to men's (see Meekes and Hassink, 2023 for the Netherlands). Whilst informative, these papers do not focus on gender differences in urban wage premium or explain them.

[5] In particular, female labour force participation increased greatly in Spain during their period of observation and extreme selection of the highest ability women may explain the lower urban wage premium for women.

More closely related to this paper, three papers provide evidence of a higher urban wage premium for women than for men, though with limited exploration of the underlying mechanisms. First, Phimister (2005) uses the British Household Panel Survey and finds that the urban wage premium of women is higher than for men (6.4% vs. 3.8%) in the period 1991-1998, using a sample selection model with similar results using OLS (6.3% vs. 3.7%) or fixed effects estimation (5.3% vs. 3.4%). However, data limitations related to the small sample size, comprising a very small number of urban-rural transitions render fixed effects estimates unreliable and restrict the comparability of results to other studies, the possibility of subgroup analysis and the scope for exploring the mechanisms underlying the gender difference. Second, Almeida *et al.* (2022) estimate the urban wage premium in Brazil using the National Continuous Household Sample Survey for 2012-2019 and find an urban wage premium for women almost double that of men (11.3% versus 5.8%). Because this data does not follow individuals' geographical transitions or allow for the inclusion of worker fixed effects, the results cannot account for spatial sorting on unobserved ability. This work also does not investigate the possible mechanisms at play. Third, Nisic (2017) uses the German Socio-Economic Panel and finds the urban wage premium with worker fixed effects is 6% for partnered women but finds no urban wage premium for partnered men. This paper adopts a partial theoretical approach, focusing exclusively on the role of relationship status and spatial restrictions in women's labour market options in explaining gender pay gaps.

This paper therefore makes several contributions. First, it offers a thorough investigation into an underexplored aspect of the urban wage premium, namely gender, with higher quality data and a longer time series than previously available. Second, it provides an important update on the magnitude of the urban wage premium in Britain, for both genders. The latest estimates and the only ones using ASHE are based on the 1998-2007 period and only focus on male workers (D'Costa and Overman, 2014). In contrast, I cover both the Financial Crisis and the recovery period, capturing important changes in the role of cities for women and men. Third, it systematically investigates theoretically grounded reasons for the observed patterns. It assesses the role of all three types of productivity mechanisms, based on the analysis of geographical, occupational and employer transitions. Finally, this paper can shed light on a new dimension of gender pay differences in the UK, the urban-rural dimension, help to understand some of its underlying drivers and identify new routes for policy intervention.

The next section provides a theoretical discussion of the mechanisms that can potentially explain a gender difference in urban wage premium and how these will be tested.

Section III describes the dataset for analysis. Section IV documents a gender difference in the urban wage premium and explores variation over time. Section V investigates what can explain the gender difference observed prior to the Financial Crisis, while Section VI investigates the change over time in the premium and its underlying mechanisms. Section VII concludes.

II. Theoretical discussion

As mentioned earlier, several factors may lead to a gender difference in urban wage premium. First, the sorting, matching, learning and sharing mechanisms with which urban economics traditionally explains the urban wage premium[6] may operate with different intensities for men and women. For example, the spatial sorting of more able workers into cities means that wages are higher in cities simply because city jobs attract more productive, higher-paid workers (see Combes *et al.,* 2008). Spatial sorting into cities could be more pronounced for women if the more productive women in rural areas are not rewarded due to labour market deficiencies there, such as a glass ceiling and discrimination and seek employment in cities. Hirsch *et al.* (2013) show that labour market gender discrimination is greater in rural than in urban labour markets in Germany. On the other hand, sorting could be *less* pronounced for women if their ability to take up better suited jobs in cities is diminished due to gender attitudes and family-related geographical search constraints. Indeed, Meekes and Hassink (2023) show that women have smaller local labour markets than men. Gender differences in spatial sorting can be identified from the wage regressions estimating the urban wage premium conducted in Section IV, by comparing between men and women the drop in the coefficient measuring the urban wage premium after worker fixed effects are included.

In the learning mechanism, cities offer better opportunities for face-to-face interactions and the generation, transmission and accumulation of knowledge, leading to more productive and therefore higher-paid workers in cities than in rural areas (De la Roca and Puga, 2017; Glaeser, 1999; Henderson, 2007; Serafinelli, 2019). Learning benefits in cities occur because of faster human capital accumulation there and is conceptualised as happening over time. They can be identified by estimating the effect of remaining with the same urban employer on annual

[6] See Duranton and Puga (2004) for a detailed theoretical discussion.

wage growth. There is little support for the idea that learning in cities benefits women and men differently, everything else equal, or that the Financial Crisis may have altered this mechanism.

The matching mechanism is based on the fact that the expected quality of a match on the labour market increases in the number of workers and firms trying to match. Since better-matched workers achieve higher productivity and cities offer greater numbers of workers and firms, this translates into higher wages for workers in cities (Baum-Snow and Pavan, 2012; Dauth *et al.,* 2022; Freedman, 2008; Helsley and Strange, 1990; Wheeler, 2006; Wheeler, 2008). Women may benefit from matching more than men because they tend to have more job transitions and career interruptions than men, which negatively affects their wages (Adda *et al.,* 2017; Goldin, 2014): thicker labour markets in cities can be an important factor counteracting this negative effect as women are more likely to match with a suitable new job in a dense labour market. Matching translates into higher yearly wage growth on average with every employer change within cities[7]: I will test whether matching in cities is greater for women by estimating the effect of changing employer in a city on yearly wage growth, compared to changing employer in a rural area, for women versus men.

In addition to the classic employer-employee matching described above, this paper also explores whether women may also benefit from better *occupational* matching in cities. Papageorgiou (2022) shows that occupational choices are greater in larger cities in the U.S.A. and provides a framework relating this fact to the urban wage premium. Koster and Ozgen (2021) show that the routine task content of occupations, independently of skills, plays a role in the urban wage premium due to the greater availability of non-routine intensive jobs in cities. In this paper, I consider whether the fact that women are selected into specific occupations could affect their earnings differently based on whether they work in locations with greater occupation choice. First, I control for TTWA-level occupational diversity in a robustness check in the static urban wage premium regressions.[8] In addition, I estimate whether the effect of changing occupation in a city on yearly wage growth is larger than the effect of changing occupation in a rural area, for women more than for men. Finally, the number of occupational choices can also affect women's wages as they transition between urban and rural jobs. I test for this by estimating the urban wage premium with worker - occupation fixed effects.

[7] This is assuming the switch in employers between *t-1* and *t* occurs just before period *t* wages are measured. Otherwise, such wage growth could also reflect the learning in cities that occurs in the year after a worker switches employers.

[8] Similarly, I control for TTWA industrial diversity to take into account gendered selection into certain industries.

In the sharing mechanism, workers are inherently more productive when they work in an urban firm, due to agglomeration economies such as labour pooling, input-output linkages or the sharing of local facilities and infrastructure. Sharing may be more relevant for women, because better transport links[9] and access to childcare[10] in cities may enable women - in particular women in the age range of caring for children - to be more productive. When sharing is at play, wage growth should increase in the year when a worker moves to a city job and decrease when they move to a rural area, *ceteris paribus*. This can be tested by first differencing the static wage equation and obtaining a model that estimates (separately for women and men) the effects of remaining in a city job (*Urban Stayer*), moving to a city job (*Incity*) and moving to a rural job (*Outcity*) on yearly wage growth as will be done in Section VI. If sharing benefits predominantly women, we should find symmetry in the *Incity* and *Outcity* coefficients for women but not for men.

Beyond the classic urban economics mechanisms, there may be differences in labour force participation and selection into work for women in cities versus rural areas. Though the literature on female labour force participation in developed economies focuses on differences in participation across cities (see Black *et al.*, 2014), to my knowledge there is no evidence on urban-rural differences. I will use the UK Labour Force Survey (LFS) to compare selection into work for women and men in urban versus rural labour markets. I will also examine observed characteristics of the sample of female movers (between rural and urban jobs in either direction) within the ASHE dataset.

In addition, women may have different working hours in cities versus rural areas which would impact their urban wages relative to being in rural jobs. Costa Dias *et al.* (2020) show that reduced working hours of women are an important factor explaining the gender pay gap in the UK. If women's working hours are particularly reduced in rural areas, this could induce a higher urban wage premium for women than men. I will therefore control for working hours in a robustness test of the urban wage premium estimations.

Moreover, past research has shown that women's wages are particularly sensitive to commuting costs (see Black *et al.*, 2014 and Crane, 2007 among others). Women's urban wage premium may therefore be affected by changes in commuting that influence women's wages differently from men's. Given ASHE provides both work and home postcodes from 2002, I am

[9] See Chatman and Noland (2014) for evidence from the U.S.A. among others.
[10] See Henau (2022) for a simulation of the likely effects of free universal early childhood education and care on women's labour market outcomes in the UK.

able to address this in two ways in Section V. First, I remove observations where workers changed work postcodes but did not change home postcodes. These are observations where we know that commuting distance has changed. Second, I control for commuting distance.

Finally, women may face less labour market discrimination in cities than in rural areas, as shown in Hirsch *et al.* (2013). This would be associated with higher wages in cities and a higher urban wage premium for women than for men. As discrimination is positively related to local employer concentration, I will control for a TTWA-level Herfindahl index of employer concentration in a robustness test.

The patterns in urban wage premium are likely to be the result of a combination of the above mechanisms. For example, there is interplay between sharing and sorting on ability into cities: workers, on average, experience lower wage growth when switching to an urban job and a lower wage penalty when switching to a rural job if they are more sorted on ability into cities. The analysis in Section VI also investigates how some of the mechanisms or factors could have changed during the Global Financial Crisis, thus affecting the relative urban wage premium for women versus men.

III. Data

The data comes from the Annual Survey of Hours and Earnings / New Earnings Survey (ASHE/NES)[11]. This is constructed from a 1% sample of employees on the Pay As You Earn (PAYE) register by the UK's Office for National Statistics (ONS). ASHE provides a representative worker-level panel in which workers are observed over several years, possibly leaving employment temporarily or permanently. I exploit available characteristics of the individual (home and work postcodes, age, gender) and of the main job held by the individual (industry, occupation, part-time status, existence of a collective agreement) as well as the basic hourly wage earned by the individual in their main job.

The measure of wage, the basic hourly wage, is the weekly basic wage divided by weekly hours worked. This excludes pay for overtime hours, any incentive pay or premium pay for work done in night shifts or during weekends and therefore provides a more like-for-

[11] See ONS (2024a).

like comparison between men and women's hourly wages for similar hours worked. Occupation codes are available at the five-digit level and recorded using SOC1990 for years 1999-2001, SOC2000 for years 2002-2010 and SOC2010 for years 2011 onwards. Five-digit industries are also recorded, using SIC2003 until 2008 and SIC2007 thereafter. I use a mapping to convert SIC2007 industry codes to SIC2003 codes. The estimations use occupation and industry indicators at the 1-digit level. ASHE does not record the educational attainment of employees: workers' broad skill levels can be captured using a correspondence from two-digit occupation codes to unskilled, low, intermediate and high-skill categories provided in the Standard Occupation Classification documentations. Finally, I exclude public sector observations as these jobs tend to have regulated wages that are set nationally. I keep workers aged between 18 and 65.

The estimation of the urban wage premium will rely on within-worker wage differentials between urban and rural locations. The spatial unit of analysis is the Travel-To-Work-Area (TTWA). TTWA are geographical units corresponding to labour markets, with approximately 75% of the resident population of a TTWA also working within the same TTWA. The theories of agglomeration relied on in this paper to explain the urban wage premium, in particular for women, are about the role of large cities and large labour markets in particular, rather than the effect of increasing density. British TTWA lend themselves to this particularly well, as they can be considered as self-contained labour markets. TTWA employment is used to distinguish rural from urban TTWA. Using a discrete city indicator allows to say something about rural labour markets and job moves between urban and rural markets which other studies investigating density variation across a dataset of cities cannot capture. Furthermore, although density gives an idea of the "compactness" of a city that is also theoretically associated with agglomeration economies, in practice, it can be subject to errors of measurement. In the case of British TTWA, some TTWA are much smaller than others in area as they are defined to be self-contained labour markets rather than administrative areas. Some TTWAs also contain large areas of unbuilt land. So, two TTWAs with the same number of workers could have very different densities.

Using individuals' work postcode, I assign workers to 297 TTWAs. As TTWA boundaries and names are re-defined periodically, after each Census, I use the TTWA defined in 1998 and based on the 1991 Census for this analysis. As the dataset runs until 2019, I map each observation to a 1998 TTWA using a combination of the postcode coordinates and 1998 TTWA boundaries in GIS. I define urban TTWAs as those whose employment exceeds

100,000 workers in 1998, all others being defined as rural[12]. A list of the 70 urban TTWA is provided in Appendix Table A1.

The sample for analysis includes 1,213,838 observations of workers aged 18-65 in Great Britain for 21 years between 1999 and 2019. 527,204 observations (43%) are from female workers, 686,634 (57%) male workers. The total number of workers is 201,837 of which 110,363 (55%) are male and 91,474 (45%) are female. On average, workers are observed over 4.6 years. Detailed statistics on the gender composition of the dataset are available in Appendix Tables A2-A5.

ASHE has many benefits for this type of analysis. First, its large size allows for reliable subgroup analysis. Second, the frequency and reliability of geographical, industrial, occupational and part-time status transitions allows to estimate the effect of cities whilst avoiding very important estimation biases[13]. The first bias comes from the sorting of more productive individuals into cities. With ASHE, I can effectively implement an individual fixed effect strategy in order to estimate the effect of cities: This effect is estimated from workers who move between a rural and an urban TTWA (in either direction). Secondly, I can also use occupation and industry fixed effects and part-time indicators to control for occupational selection and selection across industries and part-time status, which are known to follow different patterns between women and men. Thirdly, I am able to include high-dimensional fixed effects, *interactions* between worker and occupation effects (or industry or part-time status) in order to capture only the effect of cities on movers' wages as they remain within a certain occupation or industry or as they remain working full or part-time. Finally, ASHE includes a firm identifier from the year 2002. This will allow to observe employer changes.

Detailed geographical information in ASHE will also allow to calculate commuting distance for each worker from 2002 when home postcodes were made available in the dataset. It will also allow me to link with useful location-level explanatory variables. To test for various explanations mentioned in the previous section, I will control for three time-varying TTWA-level characteristics which vary with TTWA size and may affect wages differently for women and men. First, TTWA occupational diversity is computed as the inverse of a Herfindahl index of employment shares across 2-digit occupation codes (aggregated from the individual data in

[12] This cut-off is based on the size distribution of British TTWAs to be consistent with those used in the literature using US data based on the size distribution of US cities (Glaeser and Maré, 2001; Yankow, 2006). It follows the classification used in earlier estimations of the urban wage premium for Britain in D'Costa and Overman (2014).

[13] I observe for example over 20,000 work moves between rural and urban locations. See Appendix tables A6 and A7 for detailed statistics on transitions.

ASHE). Second, industrial diversity is analogously constructed as the inverse of the Herfindahl index of employment shares across 1-digit industries obtained from the Business Structure Database (BSD).[14] The third TTWA characteristic is TTWA-level employer concentration. This is a Herfindahl index of employment shares of establishments in each TTWA, computed using the BSD. Appendix Table A8 shows that these measures vary greatly between rural and urban locations: Occupational diversity and industrial diversity are considerably higher in urban than in rural areas, while employer concentration is much lower in urban areas.

Table 1 provides summary statistics of the variables, for men and women. For almost all variables, the means are significantly different between men and women. The composition of the female sample is similar to that of the male sample in terms of age, urban status and distribution across cities of different sizes (small city, big city, London[15]). However, women are more likely to work in their TTWA of residence: 75% work in their TTWA of residence (corresponding to the TTWA definition) versus 63% of men. This is consistent with aggregate data that shows that women's commutes are shorter than men's and with results in Meekes and Hassink (2023) showing that local labour markets are smaller for women than for men.

Looking at occupation, females are relatively overrepresented in occupation classes 4 (Administrative and Secretarial Occupations), 6 (Personal Service Occupations) and 7 (Sales and Customer Service Occupations) and underrepresented in classes 1 (Managers and Senior Officials), 5 (Skilled Trades Occupations) and 8 (Process, Plant and Machine Operatives). There are also notable differences in selection across industries. Females are over four times more likely to work part time than males (37% vs. 8%). The mean wages of females are considerably lower (£10.78 per hour compared to £13.57 per hour for males). These features are all consistent with the aggregate statistics. Women also tend to have lower skills, when measured by the occupation held in the first year observed.

Turning to geographical mobility, the female and male samples have the same propensity to transition in and out of cities (about 1% of observations in each direction). 11% of male observations are from movers, *i.e.* workers who transition between rural and urban jobs at least once, versus 9% of observations for women. Employer changes are slightly higher for women (11% of observations versus 10%) and occupation changes account for 9% of observations for both genders. Although average wage levels are higher for men, mean annual wage growth is about the same for women and men. Wage growth in years when moving into

[14] See ONS (2024b).
[15] Small cities are 54 TTWA with employment greater than 100,000 and less than 250,000 in 1998; big cities are 15 TTWA with 250,000 to 1 million workers.

a city job is also comparable, but wage growth in years when moving out of a city job is considerably lower for women (6.76% versus 8.41% for men).

The Appendix provides summary statistics by mover status for men (Table A9) and for women (Table A10). We can observe significant differences in the samples. In particular, movers are on average younger, more likely to be Managers and Senior Officials and less likely to work part time. They are more likely to change employer or occupation. Wage levels are similar between movers and non-movers, although movers experience faster average wage growth.

Table 1: Summary statistics

	Male	Female		
	Mean	Mean	Difference in means	t-stat
Age	41.31	40.95	0.366***	(16.66)
% aged 18-24	0.09	0.11	-0.0193***	(-35.78)
% aged 25-34	0.24	0.23	0.00836***	(10.77)
% aged 35-44	0.26	0.24	0.0157***	(19.76)
% aged 45-65	0.42	0.42	-0.00478***	(-5.29)
Managers and Senior Officials	0.17	0.11	0.0657***	(102.67)
Professional Occupations	0.13	0.09	0.0416***	(71.64)
Associate Professional and Technical Occupati	0.12	0.11	0.0132***	(22.77)
Administrative and Secretarial Occupations	0.07	0.27	-0.208***	(-326.56)
Skilled Trades Occupations	0.15	0.02	0.133***	(258.94)
Personal Service Occupations	0.02	0.10	-0.0780***	(-185.93)
Sales and Customer Service Occupations	0.07	0.18	-0.105***	(-181.72)
Process, Plant and Machine Operatives	0.14	0.03	0.110***	(213.85)
Elementary Occupations	0.13	0.10	0.0282***	(47.86)
SIC 0	0.01	0.00	0.00588***	(35.47)
SIC 1	0.04	0.03	0.0145***	(44.00)
SIC 2	0.13	0.05	0.0769***	(145.47)
SIC 3	0.07	0.02	0.0508***	(126.09)
SIC 4	0.08	0.03	0.0557***	(130.48)
SIC 5	0.23	0.29	-0.0622***	(-78.22)
SIC 6	0.16	0.12	0.0338***	(52.84)
SIC 7	0.17	0.18	-0.00743***	(-10.65)
SIC 8	0.07	0.22	-0.155***	(-253.69)
SIC 9	0.04	0.05	-0.0134***	(-35.02)
Part-time	0.08	0.37	-0.297***	(-430.73)
Collective agreement	0.39	0.37	0.0186***	(20.96)
Basic hourly earnings	13.57	10.78	2.789***	(197.08)
City	0.76	0.76	0.00208**	(2.65)
Small City	0.34	0.33	0.00985***	(11.37)
Big City	0.27	0.27	0.000956	(1.17)
London	0.14	0.15	-0.00872***	(-13.52)
Works in TTWA of residence	0.63	0.75	-0.115***	(-127.64)
Mover	0.11	0.09	0.0289***	(52.12)
Rural to urban move	0.01	0.01	0.00230***	(10.87)
Urban to rural move	0.01	0.01	0.00178***	(8.26)
Employer change	0.10	0.11	-0.0111***	(-18.42)
Occupation change	0.09	0.09	0.000298	(0.51)
Wage growth (%)	6.12	6.29	-0.169***	(-4.15)
In-city wage growth	10.99	10.31	0.671	(1.09)
Out-city wage growth	8.41	6.76	1.657**	(3.05)
No skills	0.13	0.10	0.0212***	(36.11)
Low skill	0.32	0.60	-0.280***	(-320.71)
Intermediate skill	0.29	0.13	0.160***	(212.62)
High skill	0.26	0.16	0.0992***	(132.74)
TTWA occupational diversity	36.21	35.64	0.565***	(31.45)
TTWA industrial diversity	37.48	37.02	0.461***	(37.12)
TTWA employer concentration	0.0029	0.0029	-0.0000157	(-1.65)
Observations	686634	527204	1,213,838	

IV. Documenting a gender difference in the urban wage premium

I estimate the urban wage premium for British workers, separately for men and for women, for the entire period and then over time. Following the existing empirical literature starting with Glaeser and Maré (2001), I estimate equation (1) below by OLS with worker fixed effects on a panel of wages and characteristics:

$$\ln w_{it} = \alpha_i + x'_{it}\beta + City_{it}\gamma + \mu_t + \varepsilon_{it} \quad (1)$$

w_{it} is the basic hourly wage of worker *i* in year *t*. x_{it} is a vector of worker and job-specific characteristics (age, age squared, part time, collective agreement and sets of one-digit occupation and industry indicators), $City_{it}$ is an indicator variable equal to 1 if the worker works in a city in year *t*, μ_t is a set of year indicators, α_i is the worker-level fixed effect and ε_{it} is the error term.

The use of panel data and worker fixed effects in addition to observable characteristics deals with unobservable time-invariant characteristics that might affect wages (for example, education). An important remaining issue with this type of estimation is that the effect of cities is estimated from the sample of workers who move between rural and urban locations (in either direction) at least once. Movers are usually a sample of selected individuals who may move because they are highly skilled or would gain the most by moving. As shown in Tables A9 and A10 and discussed in the previous section, movers and non-movers differ in their observable characteristics. In particular, female movers are different from male movers. For example, 21% of male mover observations are from Managers and Senior Officials, compared to 14% for female movers. Male mover observations are on average older than female movers and they are less likely to be part-time (6% versus 31% of observations are part time).

Moreover, unobserved factors or events may cause a worker to move between a rural and an urban location and at the same time affect the worker's wages. This limits the causal interpretation of the estimates of the urban wage premium. As described in the previous section, I will include in additional regressions three TTWA-level characteristics that may affect women and men's wages differently. In addition to testing for specific hypotheses about women's urban wage premium, this helps to mitigate concerns about the endogenous sorting of workers into different types of locations.

Table 2: Urban wage premium by gender

	Male			Female		
	(1)	(2)	(3)	(4)	(5)	(6)
City	0.161***	0.085***[a]	0.016***[c]	0.166***	0.095***	0.022***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Age		0.047***[a]	0.097***[a]		0.031***	0.087***
		(0.001)	(0.001)		(0.000)	(0.001)
Age^2		-0.001***[a]	-0.001***[a]		-0.000***	-0.001***
		(0.000)	(0.000)		(0.000)	(0.000)
Part-time		-0.087***[c]	0.047***[a]		-0.094***	0.028***
		(0.003)	(0.003)		(0.002)	(0.002)
Collective agreement		0.016***[a]	0.006***[a]		0.006***	0.001
		(0.002)	(0.001)		(0.002)	(0.001)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Worker and job characteristics		Yes	Yes		Yes	Yes
Industry dummies		Yes	Yes		Yes	Yes
Occupation dummies		Yes	Yes		Yes	Yes
Worker fixed effects			Yes			Yes
Observations	686,634	686,634	686,634	527,204	527,204	527,204
R^2	0.067	0.552	0.480	0.127	0.588	0.449
Mean of dependent variable	2.458	2.458	2.458	2.247	2.247	2.247
N workers			110,363			91,474

Dependent variable: ln basic hourly earnings. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table 2 reports the results from the estimations of the wage equation for males (left panel) and females (right panel) separately.[16] The first column of each panel reports results of an OLS regression of log wage on the city indicator and the year indicators only. This estimates the urban wage premium at 16.6% for women and 16.1% for men and the difference is not statistically significant.[17] As expected, the coefficients on *City* are considerably reduced when I introduce occupation and industry indicators as well as worker and job characteristics, dropping to 9.5% for women and 8.5% for men (here the difference in coefficients is statistically significant at the 1% level). Columns (3) and (6) report the estimates from the full model with individual and job characteristics and individual fixed effects. The estimates drop further: the urban wage premium is now 2.2% for women and 1.6% for men: There is a large gender difference of 37%, which is statistically significant at the 10% level. The results in

[16] This is equivalent to results from a single model where all variables are interacted with a female indicator.
[17] Throughout the paper, where differences between male and female coefficients are statistically significant at the 1%, 5% and 10% levels between the male and female samples, this is indicated by letters *a*, *b* and *c* respectively next to the coefficients in the left panel.

Table 2 also reveal that several other determinants of wages are significantly different between men and women.[18]

Table 3 provides a set of estimations to verify the robustness of the result. I first replicate the fixed effects estimation of Table 2, columns (3) and (6) with standard errors clustered at the TTWA level. Secondly, since both the prevalence of part-time work and its impact on wages differ greatly between men and women, columns (3) and (4) present results where part-time observations have been excluded: the estimates are similar to those obtained from the full sample, although no longer significantly different from each other. Further results consider alternative definitions of urban status and of the dependent variable. In columns (5) and (6), the *City* indicator is replaced with a continuous measure of city size, ln TTWA employment. Doubling labour market size results in 1% higher wages for men and 1.5% higher wages for women and the gender difference is significant at the 1% level. Secondly, I consider an alternative definition of wages, gross hourly wage, which includes bonus and overtime pay in addition to basic pay. The results are broadly similar to those obtained from the baseline specifications.

Table 3: Robustness

	S. e. clustering at TTWA level		No part-time		Ln TTWA employment		Gross hourly wage	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
City	0.016***[b]	0.022***	0.015***	0.021***	0.010***[a]	0.015***	0.017***[c]	0.023***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)
Observations	686,369	526,828	634,360	330,747	686,634	527,204	678,875	522,580
R-squared	0.943	0.933	0.527	0.569	0.481	0.451	0.433	0.415
Mean dpdt variable	2.458	2.247	2.485	2.352	2.458	2.247	2.512	2.280
N workers	110,363	91,474	104,324	65,769	110,363	91,474	110,015	91,271

Dependent variable: ln basic hourly earnings. All specifications include worker and job characteristics, year, industry, occupation indicators and worker fixed effects. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

The urban wage premium over time

The results above, based on the entire period spanning the years 1999-2019, can of course hide important differences across time, particularly as the period includes the Global Financial Crisis. Both the role of cities in enhancing wages and gender pay differences are

[18] Focusing on the fixed effects specification in columns (3) and (6), wages increase in age for men more than for women and the returns to part-time work are higher for men than women. This result is instructive, as the prevalence of part-time work among women is widely portrayed as one of the main causes of the raw gender pay gap. The coefficients on most occupation and industry indicators are also significantly different for men and women.

likely to have been affected during the crisis. I therefore break down the analysis into a pre-crisis period (1999-2007), a crisis period (2008-2013) and a post-crisis or recovery period beginning in 2014, when the British labour market is considered to have come back to its pre-crisis level.

Table 4 reveals that an important change in the urban wage premium occurred during and after the 2008 Financial Crisis. The gender difference in urban wage premium is only significant in the pre-crisis period and has closed during the crisis. Indeed, prior to 2008, women's urban wage premium with fixed effects was 2.8% (column (6)), more than twice the magnitude of men's (1.2%). The difference is statistically significant at the 1% level. The urban wage premium for women drastically drops during the Financial Crisis period, from 2.8% to 1.4% (the drop is statistically significant) and remains at 1.6% post-crisis. In contrast, the urban wage premium for men has not significantly changed over the three periods. Since the Financial Crisis, the estimated urban wage premium is not statistically significantly different for men and women. Appendix Table A11 shows estimations where coefficients are standardised for each gender. The results are qualitatively similar.

Table 4: The urban wage premium over time

		Male			Female		
		(1)	(2)	(3)	(4)	(5)	(6)
1999-2007	City	0.178***	0.097***[a]	0.012***[a]	0.182***	0.113***	0.028***
		(0.005)	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)
	Observations	276,839	276,839	276,839	197,792	197,792	197,792
	R^2	0.051	0.546	0.399	0.079	0.573	0.412
	Mean of dependent variable	2.342	2.342	2.342	2.078	2.078	2.078
	N workers			58,264			44,352
2008-2013	City	0.161***	0.083***[a]	0.015***	0.170***	0.096***	0.014**
		(0.005)	(0.003)	(0.005)	(0.005)	(0.003)	(0.006)
	Observations	209,033	209,033	209,033	163,836	163,836	163,836
	R^2	0.018	0.537	0.209	0.026	0.551	0.201
	Mean of dependent variable	2.507	2.507	2.507	2.295	2.295	2.295
	N workers			57,940			48,002
2014-2019	City	0.138***	0.070***	0.010**	0.142***	0.074***	0.016***
		(0.005)	(0.003)	(0.004)	(0.004)	(0.003)	(0.006)
	Observations	200,762	200,762	200,762	165,576	165,576	165,576
	R^2	0.026	0.532	0.335	0.037	0.534	0.263
	Mean of dependent variable	2.565	2.565	2.565	2.402	2.402	2.402
	N workers			52,929			45,110
	Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
	Worker and job characteristics		Yes	Yes		Yes	Yes
	Industry dummies		Yes	Yes		Yes	Yes
	Occupation dummies		Yes	Yes		Yes	Yes
	Worker fixed effects			Yes			Yes

Dependent variable: ln basic hourly earnings. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

In order to check the robustness of the large gender difference in urban wage premium during the pre-Financial Crisis period, I first remove years one at a time, then two at a time. The results, available upon request, are nearly identical. I then split the first period into two six-year periods (1999-2004 and 2002-2007), thus matching the length of the crisis and post-crisis periods. The results, reported in Table A12 are also very similar to the baseline result.

I next check the robustness of the large drop in female urban wage premium since the crisis. Results available upon request show that the results are robust to the exclusion of London observations as well as to changing the definition of urban wage premium by estimating the big city premium over small cities and rural TTWA. Using a continuous measure of TTWA size (ln TTWA employment) yields the same qualitative result (see Table A13).[19] When replacing basic hourly earnings with gross hourly earnings as the dependent variable (see Table A14), the results in the first two periods are also qualitatively unchanged. However, women's urban wage premium rises again in the recent period, suggesting that non-base pay (such as bonuses and overtime pay) now drives a wedge between men and women's returns to working in cities.

To conclude, I find an urban wage premium that is significantly higher for women than for men when considering the entire period. When looking at separate periods however, this gender difference is only present in the pre-crisis period as women's urban wage premium significantly drops during the Financial Crisis and remains at a level comparable to men since then. Given the similar magnitude in the most recent period, understanding whether cities may help to reduce gender pay differences at present requires a careful analysis of the underlying mechanisms for women and men. The remaining of the paper will address the two phenomena of the existence and subsequent closing of the gender gap in urban wage premium.

V. Explaining the gender difference in urban wage premium pre-2008

The higher urban wage premium for women can be explained to some extent by the differing sorting patterns revealed in Table 4. The extent of sorting on observable

[19] Similarly, results available upon request show that using employment density yields similar results: doubling employment density increases wages by 1.9% for women and 0.9% for men pre-Financial Crisis and the gender difference is statistically significant at the 1% level. The effect for women drops to 1.2% during the crisis period and is no longer statistically different from men's.

characteristics into cities can be seen by the drop in *City* coefficients between column (1) and column (2) for men or between column (4) and column (5) for women. Similarly, sorting on unobservables can be seen in the ratio of coefficients in column (3) to column (1) for men and column (6) to column (4) for women. This reveals that there was less sorting on observables and unobservables for women than for men in the pre-crisis period, which can explain women's larger urban wage premium.

In addition, cities may offer women the opportunity to achieve better matching between their skills and their job, compared to remaining in their current rural labour market. I investigate this along three dimensions, corresponding to three main drivers of the gender wage gap: selection on occupation, selection on industry and selection into part-time work. Indeed, it is widely accepted that the main reasons for the raw difference in wages between women and men is that women tend to work in lower-paying occupations, lower-paying industries (some of the higher-paying industries being "male-dominated") and disproportionately work part-time compared to men. All the results already control for occupation, industry and part-time status. I now investigate to what extent *switches* in these three factors that happen concurrently with a geographical job transition might explain the measured gender difference in urban wage premium prior to 2008.

This is done by estimating equation (2) below, a fully interacted model where the *City* indicator and other explanatory variables are interacted with a *Female* indicator (equivalent to estimating equation (1) separately for men and women) and where worker fixed effects are now interacted with first the occupation dummies, then industry dummies and finally the part-time indicator. The resulting urban wage premia therefore capture the effect of cities on the wages of workers when they do not switch occupation, or industry or part-time status.

$$\ln w_{it} = x'_{it}\,\beta + City_{it}\,\gamma + City_{it} \cdot Female_i\,\lambda + x'_{it} \cdot Female_i\,\eta + \mu_t \cdot Female_i + \alpha_i \cdot \iota_{it} + \varepsilon_{it} \quad (2)$$

where ι_{it} is a vector of occupation or industry dummies or the *Part-time* indicator.

Table 5 presents the results of these estimations in the pre-crisis period. For reference, column (1) corresponds to the baseline results with worker fixed effects presented in panel 1 of Table 4. The number of observations in Table 5 corresponds to the sample used in the specification of column (5), where all effects are interacted. Since the estimation in column (5) includes more fixed-effect groups, additional singleton observations are being dropped and the

sample size reduces from 474,631 (in Table 4) to 429,135. In spite of the reduced sample, in column (1), there is still a statistically significant gender difference in the urban wage premium.

Column (2) includes worker-occupation fixed effects.[20] Though the point estimate of the interaction term between *City* and *Female* remains relatively large compared to the baseline coefficient, it is no longer significant. This is evidence that the gender gap in urban wage premium observed in column (1) is driven by observations when female workers change occupation at the same time as they transition between urban and rural jobs, in either direction. Occupational changes during urban-rural job transitions account for 13% of women's measured urban wage premium.[21]

Column (3) introduces worker-industry fixed effects while also controlling for occupation. The *City x Female* interaction is still statistically significant, meaning that the gender difference identified in the main results does not come from workers changing industry during urban-rural job transitions. Finally, I introduce in column (4) worker x part-time fixed effects. The female interaction is still statistically significant, meaning switches in full-time status of women when they also switch between rural and urban jobs do not explain why women's wages benefit more from cities than men's do. In the final column, I interact worker fixed effects with occupation, industry and part-time status. The gender difference in urban wage premium is again insignificant: When the urban wage premium estimate is based on women who remained not only within their occupation but also within their industry and part time status, there is no significantly higher urban wage premium for women.

[20] Note that the number of workers that switch occupation or industry or part-time status is limited (for example, we have 104,261 worker x occupation groups versus 92,062 worker fixed effects, implying about 12,000 workers switch occupations), so the estimates are likely based on a selected sample.

[21] Women's urban wage premium drops from 2.3% to 2% when the worker - occupation fixed effect is included.

Table 5: Urban wage premium with fixed effects interactions, pre-crisis period

	Worker fixed effects	Worker x occupation f.e.	Worker x industry f.e.	Worker x part time f.e.	Worker x industry x occupation x part time f.e.
	(1)	(2)	(3)	(4)	(5)
City	0.012***	0.013***	0.007*	0.010***	0.008**
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Cityxfemale	0.011*	0.007	0.010*	0.009*	0.009
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Occupation dummies	Yes	No	Yes	Yes	No
Industry dummies	Yes	Yes	No	Yes	No
Part-time indicator	Yes	Yes	Yes	No	No
Observations	429,135	429,135	429,135	429,135	429,135
R^2	0.964	0.430	0.961	0.959	0.958
Mean dependent variable	2.243	2.243	2.243	2.243	2.243
N workers	92,062	92,062	92,062	92,062	92,062
N groups	92,062	104261	98959	95298	111422

Dependent variable: ln basic hourly earnings. Years: 1999-2007. All specifications are fully interacted and include worker and job characteristics, as well as year effects. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%.

Following the discussion in Section II, I also consider the potential role of local labour market occupational and industrial choices as well as rural-urban differences in employer concentration and discrimination. Results in Table A15 show that controlling for TTWA-level occupational diversity, industrial diversity and employer concentration, separately or together does not change the nature of the results. I next consider the possibility that gender differences in commuting may explain the results, first by removing observations where workers changed work postcodes but did not change home postcodes, next by controlling for commuting distance computed as the geodetic distance between home and work postcodes. Appendix Tables A16 and A17 show that the results are maintained.[22] Finally, controlling for average weekly worked hours also leaves the results largely unchanged (see Appendix Table A18).

This set of results therefore indicates that the higher urban wage premium for women was due in part to lower sorting into cities for women and in part to *occupational* changes simultaneous to urban-rural job transitions that affected women's wages.

[22] Related to commuting, the summary statistics in Tables 1, A19 and A20 show that the proportion of women who work in their TTWA of residence is larger than for men and this is stable over time. This means that the relevant labour markets are smaller for women than for men. We know from Meekes and Hassink (2023) that the estimates of the urban wage premium tend to increase in the spatial unit size. This means that with larger spatial units, men's urban wage premium would be larger. This may explain part of the difference between female and male estimates pre-Financial Crisis, however it would not explain why the gender difference has disappeared.

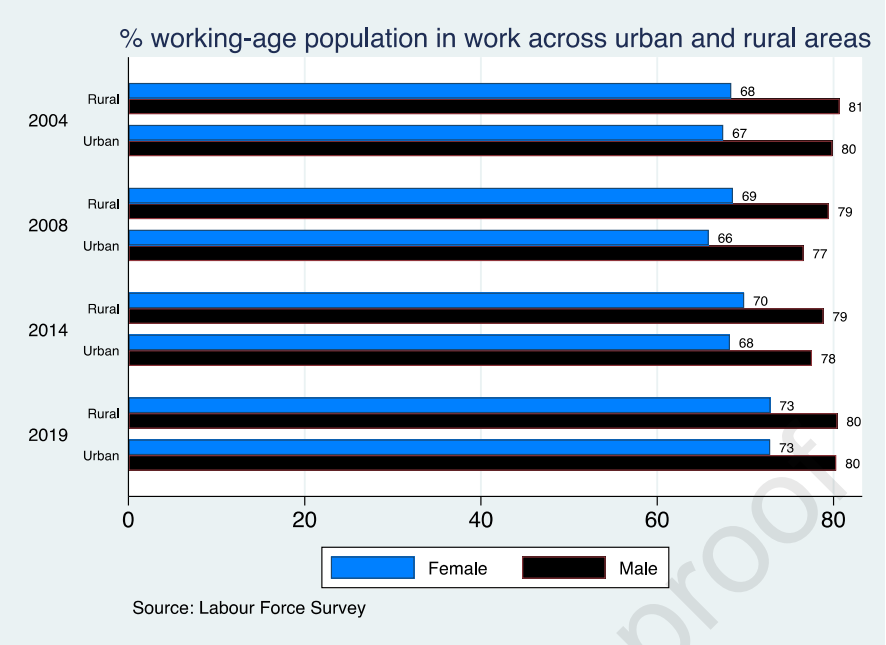
VI. Explaining the change over time

Selection

Section II discusses the possible role of women's selection into work in rural versus urban areas and changes in this selection over time. Greater selection into work in rural areas than in cities during the Financial Crisis could explain why those who are in a job do not experience reduced wages when moving from an urban to a rural job and this would decrease the measured urban wage premium. Dolado *et al*. (2020) already show that the Great Recession increased female selection into work in the UK, more than for men and that this was followed by a reversal in the recovery period. However, there is no evidence on subnational patterns in rural versus urban labour markets. I now check in the UK Labour Force Survey whether women's selection into work differs between urban and rural labour markets over time.

First, the patterns of labour force participation by gender and across rural and urban Travel-To-Work-Areas (TTWA), are shown in Appendix Figure A1. There is an increase in female labour force participation over time. For both men and women, the Financial Crisis period brought about a gap in labour force participation between rural and urban areas, with urban areas having slightly lower participation rates. By 2019, participation rates were again the same across rural and urban areas within gender. Next, Figure A2 provides data on unemployment rates, also from the LFS. There is convergence over time in unemployment rates, both between men and women and between rural and urban areas. Finally, combining the participation and unemployment data sheds light on selection into work for men and women: Figure 1 below provides the percentage of the working-age population that is in work, reflecting levels of selection for men and women.

Figure 1: In work as a percentage of the working-age population[23]



Within gender, levels of selection are the same in rural and urban areas in non-crisis periods (73% in work for women and 80% for men in 2019). During the Financial Crisis however, selection was more pronounced in cities than in rural areas and slightly more so for women: 66% in work in urban areas versus 69% in rural areas for women in 2008 and 77% versus 79% for men. Given that for women, job loss during the Financial Crisis affected more low skilled and low wage jobs, selection into work is likely to have favoured higher earners. This would tend to increase, rather than decrease the measured urban wage premium for women during the Financial Crisis. Though this is suggestive evidence, the aggregate data on labour market selection does not explain the drop in urban wage premium for women during the Financial Crisis.

Next, I check within the ASHE dataset for changes in observable characteristics of female versus male workers over time. Tables A19 and A20 show that almost all the observable characteristics have significantly changed over time, for women as well as men. However, the basis for the estimates of the urban wage premium is the sample of movers across rural and urban jobs and there may also be observable changes in selection into the group of movers over time. I show in Table 6 the evolution in the characteristics of female movers. Significant changes over time can be observed, among which the reduction in collective agreements and

[23] Figures prior to 2004 and in some later years could not be obtained due to missing unemployment data at the local authority level.

changes in the occupational composition of the female sample during the crisis. However, for most of the characteristics, very similar changes in observable characteristics are present in the male mover sample (see Table 7).

Table 6: Observable characteristics of female movers over time (ASHE dataset)

	1999-2007	2008-2013			2014-2019		
	mean	mean	diff.	t-stat	mean	diff.	t-stat
Age	38.37	38.95	-0.586***	(-4.51)	38.72	0.23	(1.56)
% aged 18-24	0.12	0.14	-0.0259***	(-6.84)	0.16	-0.0210***	(-4.85)
% aged 25-34	0.28	0.24	0.0404***	(8.13)	0.26	-0.0173***	(-3.33)
% aged 35-44	0.29	0.25	0.0358***	(7.13)	0.20	0.0524***	(10.43)
% aged 45-65	0.31	0.36	-0.0503***	(-9.50)	0.37	-0.0140*	(-2.44)
Managers and Senior Officials	0.18	0.15	0.0284***	(6.79)	0.09	0.0560***	(14.27)
Professional Occupations	0.06	0.09	-0.0295***	(-10.09)	0.11	-0.0246***	(-6.82)
Associate Professional and Technical Occupations	0.11	0.13	-0.0238***	(-6.57)	0.12	0.00616	(1.54)
Administrative and Secretarial Occupations	0.31	0.21	0.103***	(20.70)	0.19	0.0223***	(4.65)
Skilled Trades Occupations	0.02	0.01	0.00366**	(2.69)	0.01	-0.00206	(-1.48)
Personal Service Occupations	0.06	0.10	-0.0402***	(-13.61)	0.13	-0.0312***	(-8.29)
Sales and Customer Service Occupations	0.17	0.19	-0.0157***	(-3.61)	0.19	-0.00158	(-0.33)
Process, Plant and Machine Operatives	0.03	0.02	0.00436*	(2.57)	0.02	-0.000571	(-0.33)
Elementary Occupations	0.07	0.10	-0.0299***	(-9.74)	0.12	-0.0245***	(-6.57)
SIC 0	0.01	0.00	0.00113	(1.42)	0.01	-0.00151	(-1.77)
SIC 1	0.03	0.03	0.00382*	(2.09)	0.03	-0.00223	(-1.16)
SIC 2	0.06	0.04	0.0118***	(4.81)	0.04	0.00524*	(2.20)
SIC 3	0.02	0.01	0.00645***	(4.40)	0.02	-0.00183	(-1.28)
SIC 4	0.03	0.04	-0.00561**	(-2.73)	0.04	0.000281	(0.12)
SIC 5	0.28	0.32	-0.0445***	(-8.63)	0.32	0.00258	(0.46)
SIC 6	0.25	0.14	0.105***	(23.55)	0.10	0.0392***	(9.95)
SIC 7	0.17	0.18	-0.00934*	(-2.17)	0.19	-0.00547	(-1.18)
SIC 8	0.12	0.18	-0.0590***	(-14.81)	0.22	-0.0385***	(-8.07)
SIC 9	0.04	0.05	-0.00996***	(-4.36)	0.05	0.0023	(0.90)
Part-time	0.30	0.31	-0.00998	(-1.93)	0.32	-0.0098	(-1.76)
Collective agreement	0.50	0.32	0.175***	(31.97)	0.28	0.0460***	(8.40)
Basic hourly earnings	9.20	11.10	-1.903***	(-30.31)	12.16	-1.057***	(-13.72)
City	0.53	0.51	0.0197***	(3.50)	0.51	0.000159	(0.03)
Small City	0.26	0.27	-0.0116*	(-2.32)	0.27	0.0012	(0.23)
Big City	0.20	0.18	0.0190***	(4.28)	0.18	-0.00236	(-0.51)
London	0.07	0.06	0.0122***	(4.50)	0.05	0.00132	(0.48)
Works in TTWA of residence	0.52	0.53	-0.00716	(-1.18)	0.51	0.0201***	(3.36)
Rural to urban move	0.12	0.10	0.0127**	(3.28)	0.12	-0.0180***	(-4.47)
Urban to rural move	0.13	0.11	0.0215***	(5.36)	0.13	-0.0192***	(-4.68)
Employer change	0.20	0.18	0.0179***	(3.72)	0.24	-0.0586***	(-11.37)
Occupation change	0.13	0.16	-0.0362***	(-8.31)	0.14	0.0237***	(5.17)
% wage growth	8.16	5.49	2.672***	(10.51)	7.16	-1.672***	(-5.91)
In-city wage growth	12.09	7.70	4.389***	(4.48)	10.64	-2.938**	(-2.73)
Out-city wage growth	6.98	6.12	0.863	(0.93)	7.04	-0.921	(-0.88)
No skills	0.06	0.11	-0.0486***	(-15.43)	0.15	-0.0366***	(-9.08)
Low skill	0.60	0.56	0.0459***	(8.27)	0.55	0.00513	(0.86)
Intermediate skill	0.17	0.16	0.0167***	(4.01)	0.14	0.0173***	(4.07)
High skill	0.16	0.17	-0.0140***	(-3.34)	0.16	0.0142**	(3.18)
TTWA occupational diversity	37.93	31.73	6.204***	(54.95)	31.11	0.617***	(9.93)
TTWA industrial diversity	39.37	34.83	4.544***	(57.33)	33.32	1.506***	(20.80)
TTWA employer concentration	0.0038	0.0040	-0.000128*	(-2.09)	0.0042	-0.000278***	(-4.94)
Observations	17316	14450			13454		

The role of selection into occupations or industries in the observed urban wage premium change over time can be assessed by evaluating whether this change can also be found within occupation and industry groups. Table A21 shows the results for the nine 1-digit occupation groups: the main result of a larger premium for women that goes away from the Financial Crisis onwards cannot be found within occupations. This indicates that the results are not related to particular occupations. It is also consistent with the importance of occupation changes in

explaining the urban wage premium. Similarly, turning to selection into industries, Table A22 also indicates that the main results do not hold within broad industry categories.

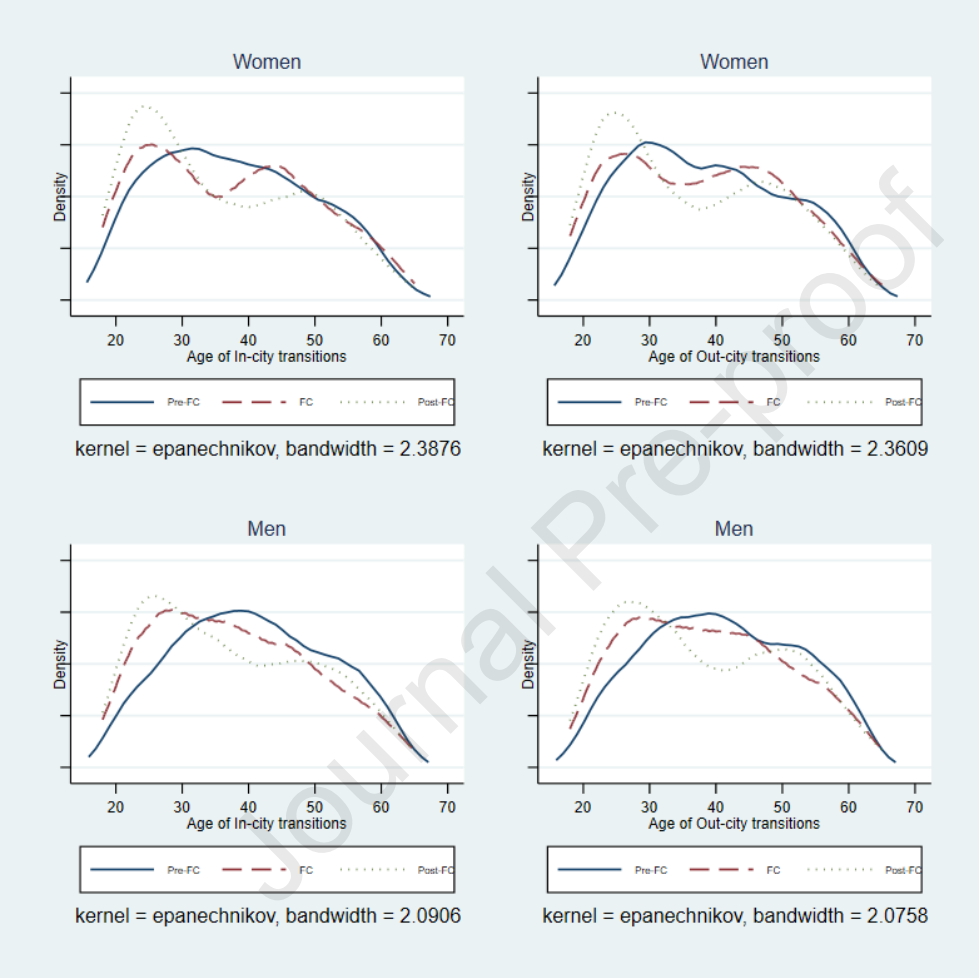
Table 7: Observable characteristics of male movers over time (ASHE dataset)

	1999-2007	2008-2013			2014-2019		
	mean	mean	diff.	t-stat	mean	diff.	t-stat
Age	40.21	39.92	0.296**	(3.11)	40.10	-0.184	(-1.69)
% aged 18-24	0.08	0.10	-0.0235***	(-9.64)	0.11	-0.0031	(-1.09)
% aged 25-34	0.25	0.25	0.00172	(0.47)	0.27	-0.0175***	(-4.33)
% aged 35-44	0.30	0.27	0.0300***	(7.81)	0.23	0.0435***	(10.85)
% aged 45-65	0.36	0.37	-0.00821*	(-2.02)	0.39	-0.0229***	(-5.12)
Managers and Senior Officials	0.27	0.20	0.0649***	(18.14)	0.13	0.0702***	(20.47)
Professional Occupations	0.11	0.14	-0.0266***	(-9.57)	0.15	-0.0104**	(-3.22)
Associate Professional and Technical Occupations	0.11	0.14	-0.0231***	(-8.29)	0.15	-0.0103**	(-3.21)
Administrative and Secretarial Occupations	0.08	0.05	0.0219***	(10.39)	0.06	-0.00595**	(-2.78)
Skilled Trades Occupations	0.15	0.12	0.0302***	(10.54)	0.11	0.00975***	(3.36)
Personal Service Occupations	0.01	0.02	-0.00649***	(-6.02)	0.03	-0.0106***	(-7.36)
Sales and Customer Service Occupations	0.07	0.08	-0.0150***	(-6.88)	0.09	-0.00740**	(-2.90)
Process, Plant and Machine Operatives	0.12	0.12	-0.00229	(-0.84)	0.13	-0.0112***	(-3.69)
Elementary Occupations	0.09	0.13	-0.0435***	(-16.68)	0.16	-0.0240***	(-7.47)
SIC 0	0.01	0.01	0.00144	(1.93)	0.01	0.000887	(1.18)
SIC 1	0.05	0.04	0.0116***	(6.65)	0.04	0.00105	(0.60)
SIC 2	0.12	0.09	0.0304***	(11.45)	0.09	0.00741**	(2.80)
SIC 3	0.07	0.05	0.0149***	(7.41)	0.06	-0.00828***	(-3.92)
SIC 4	0.11	0.10	0.0044	(1.70)	0.10	0.00733**	(2.66)
SIC 5	0.21	0.24	-0.0306***	(-8.73)	0.26	-0.0179***	(-4.49)
SIC 6	0.19	0.18	0.0125***	(3.80)	0.16	0.0183***	(5.30)
SIC 7	0.17	0.20	-0.0279***	(-8.55)	0.20	-0.00327	(-0.89)
SIC 8	0.04	0.05	-0.0157***	(-9.11)	0.06	-0.00752***	(-3.56)
SIC 9	0.04	0.04	-0.000967	(-0.62)	0.03	0.00192	(1.13)
Part-time	0.04	0.07	-0.0307***	(-16.19)	0.08	-0.0107***	(-4.39)
Collective agreement	0.47	0.34	0.126***	(30.69)	0.32	0.0237***	(5.46)
Basic hourly earnings	12.28	14.07	-1.782***	(-28.20)	14.95	-0.884***	(-11.78)
City	0.56	0.53	0.0249***	(5.92)	0.53	0.00167	(0.36)
Small City	0.29	0.29	0.0046	(1.20)	0.30	-0.0135**	(-3.23)
Big City	0.21	0.20	0.0167***	(4.88)	0.19	0.0122***	(3.37)
London	0.05	0.05	0.00361	(1.95)	0.05	0.00293	(1.50)
Works in TTWA of residence	0.41	0.42	-0.0158***	(-3.50)	0.43	-0.00263	(-0.58)
Rural to urban move	0.11	0.09	0.0210***	(7.54)	0.11	-0.0193***	(-6.64)
Urban to rural move	0.12	0.09	0.0213***	(7.54)	0.11	-0.0116***	(-4.01)
Employer change	0.18	0.15	0.0265***	(7.79)	0.19	-0.0434***	(-11.91)
Occupation change	0.12	0.14	-0.0223***	(-7.14)	0.12	0.0275***	(8.39)
% wage growth	8.17	5.31	2.856***	(13.69)	6.56	-1.249***	(-6.60)
In-city wage growth	12.63	9.02	3.603***	(3.32)	10.69	-1.664*	(-2.02)
Out-city wage growth	8.80	6.92	1.878*	(2.29)	9.35	-2.432**	(-2.64)
No skills	0.07	0.14	-0.0668***	(-26.61)	0.18	-0.0411***	(-12.33)
Low skill	0.30	0.31	-0.0112**	(-2.88)	0.34	-0.0310***	(-7.19)
Intermediate skill	0.34	0.28	0.0588***	(15.05)	0.25	0.0289***	(7.08)
High skill	0.29	0.27	0.0191***	(5.04)	0.23	0.0432***	(10.82)
TTWA occupational diversity	38.62	32.04	6.574***	(78.13)	31.43	0.608***	(13.31)
TTWA industrial diversity	39.72	35.17	4.549***	(75.88)	33.74	1.426***	(25.92)
TTWA employer concentration	0.0038	0.0039	-0.000109*	(-2.25)	0.0042	-0.000306***	(-6.23)
Observations	31335	25422			21959		

A notable difference in Tables 6 and 7 between male and female movers over time is in their age: The proportion of female movers between 25 and 44 has decreased relatively more than for men, from 57% pre-crisis to 46% during the recovery versus 55% to 50% for men. I show in Figure 2 densities of the age of urban-rural transitions for men and women. For women before the Financial Crisis, the transition age (in either direction) peaked at 30 but the density was relatively flat. The age of both types of transitions has changed during the Financial Crisis,

with far fewer women of child rearing age likely to make urban-rural job transitions in either direction.[24] The distributions of transition ages have become bimodal, with peaks at ages 25 and 50. By the recovery period, women's transition age densities have become skewed towards younger ages, to the detriment of the 30-40 age bracket.

Figure 2: Densities of the age of transitions into and out of urban jobs.



Sharing and the role of job transitions

I now investigate the possibility that the weakening of the sharing mechanism during the Financial Crisis may explain the drop in urban wage premium. To identify sharing, I turn to measuring "dynamic" agglomeration effects, via the analysis of wage growth.

[24] For men, a hollowing out of the transition age distribution can also be observed, however this is far less pronounced and happens later, post-2014.

First differencing (1) gives the following equation[25]:

$$\Delta \ln w_{it} = \Delta x'_{it}\beta + \Delta City_{it}\gamma + \Delta \mu_t + \Delta \varepsilon_{it} \quad (3)$$

Changes to the $City_{it}$ indicator between *t-1* and *t* can capture the effects of remaining in an urban labour market, moving into an urban labour market and moving out of an urban labour market on yearly wage growth. I therefore estimate the following equation, which includes indicators for each of these possibilities:

$$\Delta \ln w_{it} = \Delta x'_{it}\beta + \gamma_1 Urban\ Stayer_{it} + \gamma_2 Incity_{it} + \gamma_3 Outcity_{it} + \Delta\mu_t + \Delta\varepsilon_{it} \quad (4)$$

The omitted category are rural stayers between *t-1* and *t*. Equation (4) estimates the effects of staying in (γ_1), switching to (γ_2), or leaving (γ_3), an urban labour market on workers' yearly wage growth, controlling for yearly changes in all the other explanatory variables.

Table 8 presents the results by period.[26] The number of observations drops compared to those in Table 4 estimating equation (1), due to first-differencing.[27] Since changes in observed characteristics including occupation and industry are controlled for, symmetry in *Incity* and *Outcity* coefficients reflects sharing benefits. For men, there is no evidence of symmetry in the effects of moving in and out of urban jobs on wage growth in the transition year: the coefficient on *Incity* is positive, but leaving a city job either has no effect on wage growth in that year (until 2013), or has a positive effect (in the recovery period). There is therefore no evidence in favour of sharing for men. For women, the effects are different and there is some symmetry before 2008, which goes away during the crisis. This indicates that the relative sharing externalities enjoyed by women have gone away during the Financial Crisis. As explained in Section II, sharing advantages in cities such as public transport and childcare infrastructure are more relevant for women of child rearing age. The marked reduction in the number of women of child rearing age making geographical job transitions into and out of urban jobs shown in Figure 2, happened concurrently with the disappearance in sharing externalities for women.

[25] This follows and adapts the identification in Yankow (2006).
[26] Table A23 presents the results of Table 8 with TTWA characteristics included. The results are qualitatively similar.
[27] To help compare the samples, I show in Appendix Table A24 that estimating equation (1) using the set of observations in Table 8 yields very similar results to those in Table 4.

Table 8: The role of urban transitions in wage growth

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Urban stayer	0.003***	0.002**	0.003***	0.002***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Incity	0.025***	0.027***	0.021***	0.009	0.021***	0.017***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Outcity	-0.001[a]	-0.024***	-0.001	-0.006	0.011**[a]	-0.014**
	(0.004)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Observations	218,575	153,440	176,893	135,546	180,803	146,744
R^2	0.034	0.035	0.042	0.040	0.052	0.042
Mean of dependent variable	0.0547	0.0566	0.0370	0.0368	0.0477	0.0465

Dependent variable: Δ ln basic hourly earnings. All specifications include first differenced worker and job characteristics and industry, occupation and year indicators. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

In the recovery period, a return of symmetry can be observed for women, although the magnitude of the effects is lower than pre-crisis. Although the demographics of women joining and leaving urban jobs are now younger and less likely to benefit from sharing, women are also less sorted on ability into cities than during the crisis. The observed return of symmetry reflects the balance of these two effects.

The results in Table 8 also shed light on the roles of urban-rural job transitions versus remaining in the urban labour market in explaining the static urban wage premium. Staying in an urban job (*Urban Stayer*) is associated with higher wage growth of about 0.3 points per annum compared to staying in a rural job, for women as well as men. The effect is mostly unchanged over time and is relatively small compared to that of transitions into and out of urban jobs. The absence of changes over time or a difference between men and women rules this component of the urban wage premium out as a possible explanation for the greater premium for women or its decrease post-2007.

The striking changes over time are seen in the effects of geographical (urban-rural) transitions. Switching to an urban job (*Incity*) increases wage growth compared to staying in a rural job and the estimates are not significantly different between genders. For women, this positive effect is particularly large pre-crisis and becomes insignificant temporarily during the Financial Crisis. Turning to out-city job transitions, these negatively affect yearly wage growth for women in the pre- and post-crisis periods and this is significantly different for men at the

1% level. Although there is no significant effect for men, women's wage growth drops by 2.4 points when they transition to a rural job during the pre-crisis period. These findings complement those presented earlier on the static urban wage premium. Women experienced a wage growth penalty as they *transition out* of a city job, rather than greater benefits than men when transitioning *into* cities. The greater measured static urban wage premium for women until the Financial Crisis is due to wage drops when leaving an urban job rather than wage increases when joining one or to faster wage growth in cities than in rural areas relative to men.

This changes during the Financial Crisis (column (4)) as women's out-city wage penalty and their in-city wage growth premium become insignificant. Both changes explain the drop in women's static urban wage premium during this period. Eventually, in the recovery period, women's wage growth premium when joining an urban job as well as women's wage growth penalty when leaving one both return, albeit at lower magnitudes that are not sufficient to significantly increase women's urban wage premium compared to the crisis period. In contrast, for men, geographical transitions of either kind now enhance wage growth (see column (5)) – by 2.1 points for in-city job transitions and 1.1 point for out-city job transitions.

The recovery period therefore distinguishes itself from the Financial Crisis period in that the urban wage premium is equalised between genders both because women's urban-rural transitions have effects on wage growth that are lower in magnitude than prior to the Financial Crisis and because men now experience positive wage growth during Outcity job transitions. Though wage growth effects of urban-rural transitions changed for women during the Financial Crisis, they changed for both women and men, and in different ways, after the crisis.

Another potential explanation for the changes in *Incity* and *Outcity* wage growth effects for women during the Financial Crisis is related to the firm dimension. These patterns could be observed if rural-to-urban (Incity) job transitions during the Financial Crisis correspond to switches to lower-quality (and therefore lower-paying) firms and urban-to-rural (Outcity) job transitions correspond to switches to higher-quality firms. To assess this explanation, I report the average change in employer fixed effects coinciding with job transitions into and out of cities, over time. The employer fixed effects are computed from estimating the wage equation (1) with dual employee and employer fixed effects.

The results are reported in Table 9. For women, pre-Financial Crisis, there is symmetry in the average changes in employer quality between rural-to-urban and urban-to-rural job transitions, with urban-to-rural job transitions corresponding to an average drop in employer

quality. During the Financial Crisis, the relation between rural-to-urban transitions and increased employer quality is unchanged, however, urban-to-rural job transitions now correspond to an *increase* in employer quality. Therefore, though employer changes do not explain the drop in the rural-to-urban (Incity) wage growth effect for women during the Financial Crisis identified in Table 8, they may explain the temporary decrease in the Outcity wage growth penalty.

It is important to note the strong gender differences in the role of employer quality during the Financial Crisis. During this period, women switching to rural jobs tend to switch to higher-quality and higher-paying employers, but this is not accompanied by a significant increase in wage growth, only by a decrease in the wage growth penalty. Women switching to urban jobs upgrade employer quality as before, but this translates into lower wage growth than before. For men on the contrary, the employer upgrading patterns in Table 9 are entirely consistent with the wage growth effects of Incity and Outcity transitions in Table 8.

In the recovery period, firm quality changes during in and out-city transitions are consistent with the observed wage growth patterns for both men and women. For men, the strong increase in employer quality upgrading during out-city transitions in the recovery period compared to previous periods corresponds to the positive wage growth effect identified in Column (5) of Table 8. For women, the return to an out-city wage growth penalty is associated with out-city employer quality downgrading, with both of the patterns being of lower magnitude compared to the pre-crisis period.

Table 9: Firm quality and moves into and out of cities

	2002-2007		2008-2013		2014-2019	
Mean change in firm fixed effect	Incity job transitions	Outcity job transitions	Incity job transitions	Outcity job transitions	Incity job transitions	Outcity job transitions
Women	0.0132948	-0.0090496	0.009342	0.0041941	0.0156125	-0.0025096
Men	0.0101028	0.0049593	0.0104502	0.0011327	0.0151693	0.0079927

This table provides the average change in employer fixed effects coinciding with job transitions into and out of cities. The employer fixed effects are computed from estimating the wage equation (1) augmented with employer fixed effects.

Occupational matching during urban-rural job transitions

Because of the role of occupational mobility in women's urban wage premium pre-crisis highlighted in the previous section, *changes* in occupational mobility may also explain the following drop in female urban wage premium. To investigate this, I first assess the change over time in the percentage of rural-to-urban moves that are also occupation upgrades, defined

as a decrease in the occupation code at the 1-digit level[28]. As shown in Appendix A7, the percentage of rural-to-urban moves that are also occupation upgrades increases over time for women, from 14.2% pre-crisis to 16%, up to 19.3% in the recent period. In addition, the percentage of women's urban to rural moves that are also occupation downgrades at the 1-digit level increases over time.

I next assess if the "intensity" of the occupation upgrades and downgrades coinciding with in- and out-city job transitions has changed over time, for women and men. Mean occupational wages by sex and rural-urban status for 1999 are computed and used to calculate expected percentage changes in wages for workers upgrading occupation during in-city transitions and workers downgrading occupations during out-city transitions, based on observed job transitions for each period. Appendix Table A25 shows that expected wage changes during urban-to-rural transitions have remained stable over time. Expected percentage wage increases during rural-to-urban transitions with occupational upgrades have slightly decreased in the Financial Crisis period, from 82% to 69%, and increased again to 78% in the recovery period, however the changes are not statistically significantly different. This, combined with the information in Table A7 reported above, indicates that the changes in female occupational-geographical mobility in the data are not consistent with the patterns in women's urban wage premium.

I now assess the contribution of occupation changes in women's wage growth during urban-rural transitions. I estimate the model of equation (4) on the subsample where years with an occupation change have been excluded.[29] Comparing the *Outcity* coefficients in Table 10 with those in Table 8 that include the full sample, shows that occupation changes have a negative contribution to women's wage growth during urban-to-rural (*Outcity*) job transitions both before and after the Financial Crisis. In fact, in the post-crisis period, there is no evidence of a significant *Outcity* wage growth penalty in the sample without occupation changes. The decrease in women's urban wage premium during the crisis is consistent with the temporary disappearance of the *Outcity* wage penalty associated with occupation changes.

[28] Since the UK SOC is based on the skill content of occupations, these occupation switches can be interpreted as changes that involve taking on a significantly higher or lower skilled job.
[29] This reduces both the male and female samples by about 8% for the first period, 11% for the second period and 8% for the third period.

Table 10: The role of urban transitions in wage growth – sample without occupation changes

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Urban stayer	0.003***[c]	0.001	0.002***	0.002***	0.002***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Incity	0.025***	0.024***	0.018***	0.012*	0.026***[c]	0.013**
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Outcity	-0.000	-0.011**	0.002	-0.001	0.012***[a]	-0.010
	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)	(0.007)
Observations	199,831	140,427	156,361	120,458	167,339	135,097
R^2	0.026	0.024	0.038	0.028	0.040	0.032
Mean of dependent variable	0.0532	0.0547	0.0352	0.0350	0.0451	0.0440

Dependent variable: Δ ln basic hourly earnings. All specifications include first differenced worker and job characteristics and industry and year indicators. Observations where the worker has changed occupation are excluded. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Matching and learning within cities

For completeness, gender differences in the roles of matching and learning within cities are now tested by identifying the contribution of employer changes and occupation changes in wage growth in years when workers do not transition across rural and urban labour markets.

First, I estimate on the sample of *t-1* to *t* periods when the worker remains either in a rural or in an urban labour market:

$$\Delta \ln w_{it} = \Delta x_{it}'\beta + \gamma City_{it} + \delta\, Employer\ Change_{it} + \theta City_{it} \times Employer\ Change_{it} + \Delta\mu_t + \Delta\varepsilon_{it} \quad (5)$$

The omitted category includes workers remaining in a rural job without changing employer. The coefficient on *City* reflects learning on the job in cities. The results are reported in Table 11. Pre-Financial Crisis, there is a gender difference in learning: wen's wage growth increased by 0.2% with every year worked with the same employer in an urban labour market whilst there is no evidence for women (columns (1) and (2)). This gender difference in favour of men is significant at the 5% level and goes away from the Financial Crisis onwards. Therefore, changes in learning do not explain the drop in women's relative urban wage premium.

The coefficient on *City x Employer Change* measures employer-employee matching in cities. There is no significant gender difference or variation over time, also ruling out changes in this type of matching as an explanation.

Table 11: Employer changes and wage growth, sample without urban-rural transitions

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
City	0.002***[b]	-0.000	0.002***	0.002**	0.001***	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Employer Change	0.006	0.004	0.004	0.007*	0.022***	0.017***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
City x Employer Change	0.010**	0.017***	0.016***	0.009*	0.013***	0.011**
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
Observations	212,829	150,071	172,786	132,973	176,417	143,743
R^2	0.034	0.034	0.043	0.038	0.055	0.042
Mean of dependent variable	0.0544	0.0565	0.0367	0.0367	0.0471	0.0464

Dependent variable: Δ ln basic hourly earnings. The sample excludes observations when workers transition between rural and urban jobs in either direction. All specifications include first differenced worker, job characteristics and industry, occupation and year indicators. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Second, I explore occupational matching within cities by identifying the contribution of occupation changes in wage growth, again in years when workers do not transition across rural and urban labour markets. I estimate Equation (6) on the sample of *t-1* to *t* periods when the worker remains either in a rural or in an urban labour market:

$$\Delta \ln w_{it} = \Delta x_{it}'\beta + \gamma\, City_{it} + \delta\, Occupation\ Change_{it} + \theta City_{it} \times Occupation\ Change_{it} + \Delta\mu_t + \Delta\varepsilon_{it} \quad (6)$$

The omitted category is remaining in a rural job without changing occupation. The coefficient on *City x Occupation Change* reflects occupational matching in cities. The results in Table 12 show that there is also no statistically significant gender difference or variation over time: the change in women's relative urban wage premium over time is not associated with a significant change in occupational matching benefits in cities. The results in columns (1) and (2) also confirm that the role of occupational matching in explaining the greater urban wage premium for women pre-crisis operates through occupational changes during geographical (urban-rural) job transitions as shown previously rather than through better occupational options while working in cities.

Table 12: Occupation changes and wage growth, sample without urban-rural transitions

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
City	0.003***	0.001	0.002***	0.002***	0.002***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Occupation Change	-0.002	0.004	0.005*	0.007**	0.008**	0.009**
	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
City x Occupation Change	0.005	0.008*	0.009***	0.005	0.011**	0.008
	(0.004)	(0.005)	(0.003)	(0.004)	(0.004)	(0.005)
Observations	212,829	150,071	172,786	132,973	176,417	143,743
R^2	0.033	0.033	0.042	0.038	0.052	0.040
Mean of dependent variable	0.0544	0.0565	0.0367	0.0367	0.0471	0.0464

Dependent variable: Δ ln basic hourly earnings. The sample excludes observations when workers transition between rural and urban jobs in either direction. All specifications include first differenced worker, job characteristics and industry, occupation and year indicators. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

To conclude, the large, persisting drop in women's urban wage premium during the Financial Crisis can be explained by the disappearance of sharing externalities previously enjoyed by women. Focusing on men, although the urban wage premium has not significantly changed over time, in the recent period, geographical transitions both into and out of urban jobs are what enhances wage growth. In contrast, for women, there is a wage growth penalty when transitioning to a rural job which is linked to poorer occupational matching and employer quality downgrading. This highlights that despite similar urban wage premia, the nature of the urban wage premium and what drives wage growth during urban-rural job transitions are different for women and men.

VI. Conclusion

This paper investigates a new source of heterogeneity in the urban wage premium: differences between men and women. I depart from the traditional approach in the literature using either data on men or pooled data from both genders and estimate the urban wage premium separately for men and for women, using the representative survey ASHE to construct a panel of over 1.2 million observations of over 200,000 British workers in the period 1999-2019. I first uncover a large, significant difference between men and women in the pre-Financial Crisis period. The urban wage premium was more than twice as high for female

workers than for male workers, after controlling for time-invariant unobserved individual heterogeneity (2.8% versus 1.2%). However, this gender difference disappears as women's urban wage premium drops considerably during the Financial Crisis.

I explore a number of factors that may explain these patterns. The analysis highlights that the nature of the urban wage premium differs for men and women. First, I provide evidence that sorting on observed and unobserved characteristics into cities was less pronounced for women than for men prior to the Financial Crisis. Second, I find that women benefited from sharing in cities pre-crisis but that this agglomeration economy disappeared during the Financial Crisis.

The paper also contributes to the new literature on occupational matching in cities, by differentiating between benefits from greater occupational choice within urban labour markets and changes in occupational choices during urban-rural job transitions. I estimate that 13% of women's static urban wage premium in the pre-2008 period came from changes in occupation that were simultaneous with urban-rural transitions. Both pre-crisis and in the recent period, women incurred a relative wage penalty when they switched to a rural job and changed occupation, which implies that women are particularly constrained in the type of occupation that they have in rural areas. In contrast, there is no significant gender difference in the effects of occupational matching while staying within the urban job market.

Finally, the paper shows that women's relative urban wage premium over time is explained by mechanisms operating during job transitions (transitions between urban and rural jobs) rather than by gender differences in mechanisms operating as workers *remain* in urban jobs. In the recent period, women switching from urban to rural jobs incur a wage growth penalty, related to poor occupational matching and employer quality downgrading. In contrast, men experience a wage growth increase, related to employer quality upgrading.

Autor (2020) makes the case that the "urban escalator" has failed in recent decades for specific ethnic minorities in the USA that are particularly affected by the polarisation of the labour market and the disappearance of the urban wage premium for non-college educated workers. This paper shows that, in Britain, women used to benefit from sharing in cities prior to the Financial Crisis, whilst men did not. This has disappeared since the crisis. On the other hand, women who leave urban jobs suffer from poor occupational matching, a deficiency of the rural labour market, whilst men do not. Women have therefore kept their longer-term disadvantages with respect to men that occur during transitions from urban to rural jobs yet have lost their prior productivity advantage versus men in cities.

This points to ways in which gender wage differences could be addressed in the current context. Since women experience a wage penalty when moving to a rural job which men do not, possible solutions include remote working in order to either retain urban jobs or have access to a wider range of occupations over a greater geographical area, and place-based interventions to broaden the range of occupations available to women in rural labour markets. This leaves a rather modest role for cities in enhancing women's wages relative to men and points to more place-based interventions in rural labour markets.

References

Adda, J., Dustmann, C., Stevens, K. (2017) The Career Costs of Children. *The journal of political economy*, 125 (2): 293–337.

Ahlfeldt, G., Bald, F., Roth, D., Seidel, T. (2021) Quality of life in a dynamic spatial model. Working paper.

Almeida, E., Araujo, V., Goncalves, S. (2022) Urban wage premium for women: evidence across the wage distribution. *World Development*, 159.

Autor, D. (2019) Work of the past, work of the future. *AEA Papers and Proceedings*, 109: 1-32.

Autor, D. (2020) The faltering escalator of urban opportunity. *Securing our economic future*: 108-136 The Aspen Institute.

Bacolod, M. (2017) Skills, the gender wage gap, and cities. *Journal of Regional Science*, 57(2): 290-318.

Baum-Snow, N., Freedman, M., Pavan, R. (2018) Why has urban inequality increased? *American Economic Journal: Applied economics*, 10(4): 1-42.

Baum-Snow, N., Pavan, R. (2012) Understanding the city size wage gap. *Review of Economic Studies*, 79(1):88–127.

Black, D., Kolesnikova, N., Taylor, L. (2014) Why do so few women work in New York (and so many in Minneapolis)? Labor supply of married women across US cities. *Journal of Urban Economics*, 79: 59–71.

Bosquet, C., Combes, P.-P., García-Peñalosa, C. (2019) Gender and Promotions: Evidence from Academic Economists in France. *Scandinavian Journal of Economics*, 121: 1020-1053.

Card, D., Cardoso, A., Kline, P. (2016) Bargaining, Sorting, and the Gender Wage Gap: Quantifying the Impact of Firms on the Relative Pay of Women. *The Quarterly Journal of Economics*, 131(2): 633-686.

Carlsen, F., Rattsø, J., Stokke, H. (2016) Education, experience and dynamic urban wage premium. *Regional Science and Urban Economics*, 60(C): 39-49.

Chatman, D. G. and Noland, R. B. (2014) Transit Service, Physical Agglomeration and Productivity in US Metropolitan Areas. *Urban Studies*, 51(5): 917-937.

Combes, P.-P., Duranton, G., Gobillon, L. (2008) Spatial wage disparities: Sorting matters! *Journal of Urban Economics*, 63: 723–742.

Costa Dias, M., Joyce, R., Parodi, F. (2020) The gender pay gap in the UK: children and experience in work. *Oxford Review of Economic Policy*, 36(4): 855–881.

Crane, R. (2007) Is there a quiet revolution in women's travel? - Revisiting the gender gap in commuting. *Journal of the American Planning Association*, 73(3): 298-316.

Dauth, W., Findeisen, S., Moretti, E., Suedekum, J. (2022) Matching in Cities. *Journal of the European Economic Association*, 20(4):1478–1521.

D'Costa, S., Overman, H. (2014) The urban wage growth premium: sorting or learning? *Regional Science and Urban Economics*, 48: 168-179.

De la Roca, J., Puga, D. (2017) Learning by working in big cities. *The Review of Economic Studies*, 84(1): 106–142.

Di Addario, S., Patacchini, E. (2008) Wages and the city. Evidence from Italy. *Labour Economics*, 15: 1040–1061.

Dolado, J., García-Peñalosa, C., Tarasonis, L. (2020) The changing nature of gender selection into employment over the great recession. *Economic Policy*, October 2020, 635-677.chs

Duranton, G. (2016) Agglomeration effects in Colombia. *Journal of Regional Science*, 56(2): 210-238.

Duranton, G., Puga, D. (2004) Micro-foundations of urban agglomeration economies, in: Henderson, J.V., Thisse, J.F. (Eds.), *Handbook of Urban and Regional Economics* 4. Elsevier, Amsterdam, pp. 2063-2117.

Freedman, M. (2008) Job hopping, earnings dynamics, and industrial agglomeration in the software publishing industry. *Journal of Urban Economics*, 64(3): 590–600.

Fuchs, M., Rossen, A., Weyh, A., Wydra-Somaggio, G. (2021) Where do women earn more than men? Explaining regional differences in the gender pay gap. *Journal of Regional Science*, 61: 1065– 1086.

Glaeser, E. (1999) Learning in cities. *Journal of Urban Economics*, 46(2): 254-277.

Glaeser, E., Maré, D. (2001) Cities and skills. *Journal of Labor Economics*, 19(2): 316-342.

Goldin, C. (2014) A Grand Gender Convergence: Its Last Chapter. *American Economic Review*, 104 (4): 1091-1119.

Gould, E. (2007) Cities, workers, and wages: A structural analysis of the urban wage premium. *Review of Economic Studies*, 74: 477–506.

Helsley, R., Strange, W. (1990) Matching and agglomeration economies in a system of cities. *Regional Science and Urban Economics*, 20(2):189–212.

de Henau, J. (2022) Simulating employment and fiscal effects of public investment in high-quality universal childcare in the UK. *International Journal of Child Care and Education Policy*, 16(1), article no. 3.

Henderson, J. V. (2007) Understanding knowledge spillovers. *Regional Science and Urban Economics*, 37(4): 497–508.

Hirsch, B., Jahn, E., Manning, A., Oberfichtner, M. (2022) The urban wage premium in imperfect labor markets. *Journal of Human Resources*, 57 Supplement: S111-S136.

Hirsch, B., König, M., Moeller, J. (2013) Is There a gap in the gap? Regional differences in the gender pay gap. *Scottish Journal of Political Economy*, 60(4): 412-439.

Jewell, S. L., Razzu, G., Singleton, C. (2020) Who works for whom and the UK gender pay gap. *British Journal of Industrial Relations*, 58(1), 50-81.

Koster, H and Ozgen, C. (2021) Cities and tasks. *Journal of Urban Economics*, 126.

Lindley, J., Machin, S. (2014) Spatial changes in labour market inequality. *Journal of Urban Economics*, 79(0):121–138. Spatial Dimensions of Labor Markets.

Matano, A., Naticchioni, P. (2012) Wage distribution and the spatial sorting of workers. *Journal of Economic Geography*, 12(2): 379–408.

Meekes, J., Hassink, W. (2023) Endogenous local labour markets, regional aggregation and agglomeration economies. *Regional Studies*, 57(1): 13-25.

Melo, P., Graham, D. (2009) Agglomeration economies and labour productivity: Evidence from longitudinal worker data for GB's Travel-to-Work Areas. Spatial Economics Research Centre (SERC), London School of Economics (LSE), Discussion Paper Nr.31.

Nisic, N. (2017) Smaller differences in bigger cities? Assessing the regional dimension of the gender wage gap. *European Sociological Review*, 33(2): 292-304.

Office for National Statistics (2024a). *Annual Survey of Hours and Earnings, 1997-2023: Secure Access.* [data collection]. *24th Edition.* UK Data Service. SN: 6689, DOI: 10.5255/UKDA-SN-6689-24.

Office for National Statistics (2024b). *Business Structure Database, 1997-2023: Secure Access.* [data collection]. *16th Edition.* UK Data Service. SN: 6697, DOI: 10.5255/UKDA-SN-6697-16.

Office for National Statistics (2023). *Gender Pay Gap in the UK: 2023.*

Papageorgiou, T. (2022) Occupational matching and cities. *American Economic Journal: Macroeconomics*, 14(3): 82–132.

Phimister, E. (2005) Urban effects on participation and wages: Are there gender differences? *Journal of Urban Economics*, 58(3): 513-536.

Porcher, C., Rubinton, H., Santamaria, C. (2023) JUE Insight: The role of establishment size in the city-size earnings premium. *Journal of Urban Economics*, 136, 103556.

Serafinelli, M. (2019) Good Firms, Worker Flows and Local Productivity. *Journal of Labor Economics*, 37 (3): 747-792.

Wheeler, C. (2006) Cities and the growth of wages among young workers: Evidence from the NLSY. *Journal of Urban Economics*, 60: 162-184.

Wheeler, C. (2008) Local market scale and the pattern of job changes among young men. *Regional Science and Urban Economics*, 38(2):101-118.

Yankow, J. (2006) Why do cities pay more? An empirical examination of some competing theories of the urban wage premium. *Journal of Urban Economics*, 60: 139–161.

Appendix

Figure A1: Labour force participation rates

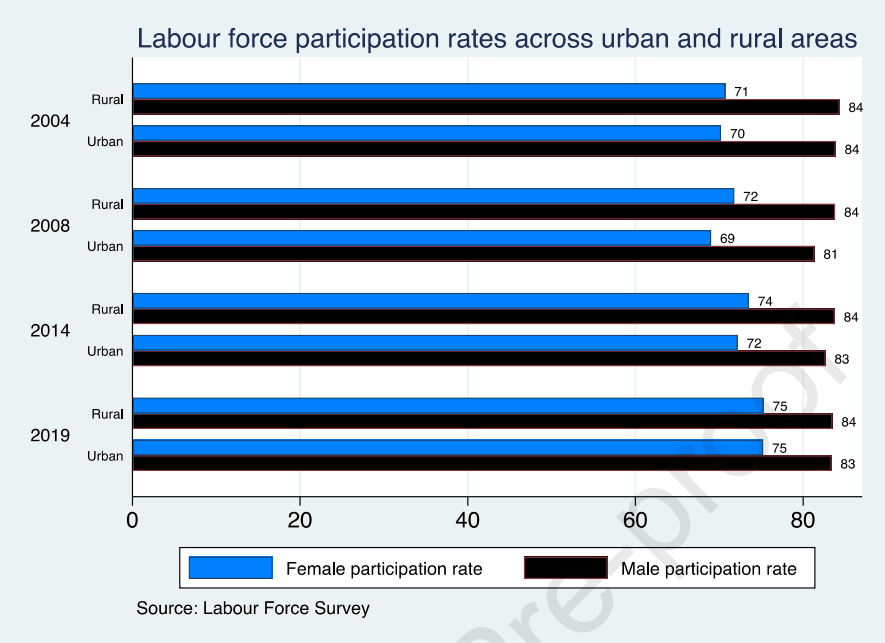


Figure A1 shows average labour force participation rates for rural and urban Travel-To-Work-Areas, for men and women. Data is publicly available at the local authority district level from 2004 onwards. This was then mapped to the Travel-To-Work-Area level using weights based on population counts.

Figure A2: Unemployment rates

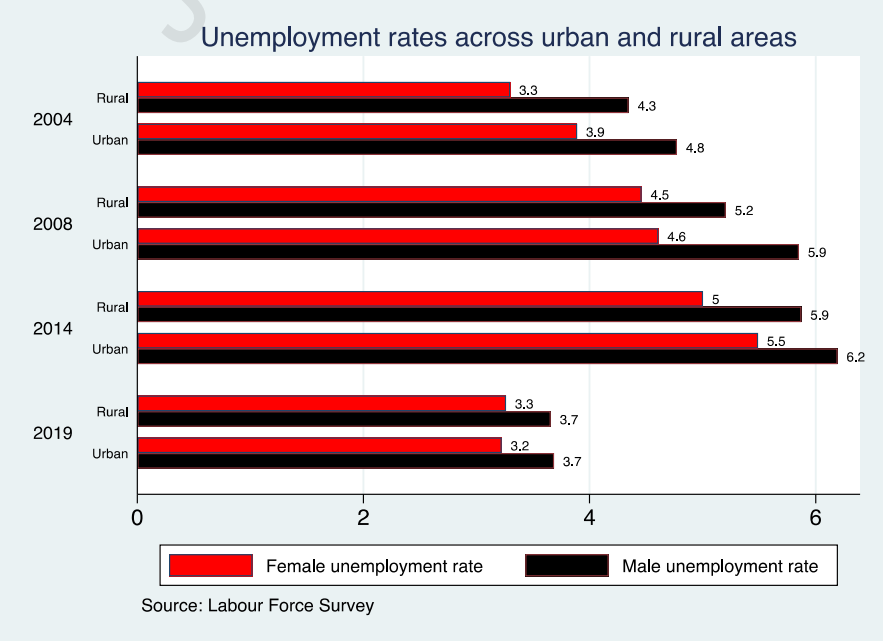


Table A1: List of urban TTWA in the dataset, by size

TTWA name	1998 Employment	TTWA name	1998 Employment	TTWA name	1998 Employment
Peterborough	102561	Cambridge	146490	Crawley	222566
Warwick	104683	Motherwell and Lanark	147605	Guildford & Aldershot	235027
Dundee	106552	Blackpool	149035	Wolverhampton & Walsall	235785
Pontypridd & Aberdare	107454	Wakefield	153724	Bradford	240386
Poole	107856	Warrington	154424	Portsmouth	241156
York	108396	Plymouth	159050	Wirral and Chester	242895
Tunbridge Wells	108538	Bournemouth	160063	Reading	248302
Chichester	110929	Stevenage	161270	Coventry	249331
Huddersfield	113680	Derby	163753	Southampton & Winchester	278893
Barnsley	115306	Colchester	164193	Leicester	283809
Crewe	121324	Preston	166868	Maidstone & North Kent	310276
Swindon	123106	Aberdeen	167386	Southend	317158
Ipswich	129300	Norwich	180881	Leeds	336464
Harlow	132063	Aylesbury & Wycombe	181544	Nottingham	349397
Swansea	132343	Brighton	187955	Bristol	353477
Exeter	133857	Wigan & St Helens	200208	Sheffield & Rotherham	363643
Milton Keynes	134828	Oxford	204280	Edinburgh	399116
Bolton	135505	Hull	204796	Liverpool	443340
Mansfield	137628	Sunderland & Durham	210868	Tyneside	488481
Northampton	139636	Stoke	213546	Slough & Woking	641708
Blackburn	143660	Middlesbrough & Stockton	217919	Glasgow	648197
Doncaster	145846	Dudley and Sandwell	220975	Birmingham	808982
Luton	146119	Cardiff	221505	Manchester	976796
				London	3462107

Source: Business Structure Database

Table A2: Gender composition of the dataset (percentage of observations)

	Male	Female	Total
Rural	56%	44%	100%
Urban	57%	43%	100%

Table A3: Gender composition of the dataset across time periods (percentage of observations)

		Male	Female	Total
1999-2007	Rural	58%	42%	100%
	Urban	58%	42%	100%
2008-2013	Rural	56%	44%	100%
	Urban	56%	44%	100%
2014-2019	Rural	55%	45%	100%
	Urban	55%	45%	100%

Table A4: Gender composition of the dataset across time periods (number of observations)

		Male	Female	Total
1999-2007	Rural	66,759	47,868	114,627
	Urban	210,080	149,924	360,004
	Total	276,839	197,792	474,631
2008-2013	Rural	49,636	39,699	89,335
	Urban	159,397	124,137	283,534
	Total	209,033	163,836	372,869
2014-2019	Rural	49,239	40,705	89,944
	Urban	151,523	124,871	276,394
	Total	200,762	165,576	366,338

Table A5: Gender composition of the dataset (number and percentage of workers)

	Male	Female	Total
Total	110,363	91,474	201,837
%	0.55	0.45	

Table A6: Statistics on transitions within the dataset (percentage of observations)

	Male	Female
Mover observations	11.5%	8.6%
Rural to urban move	1.2%	1.0%
Urban to rural move	1.2%	1.1%
Into London move	0.8%	0.8%
Out of London move	0.8%	0.8%
Employer change	9.6%	10.7%
Occupation change	9.2%	9.1%
Occupation change within city	6.7%	6.6%
Occupation change & in-city move	0.3%	0.3%
Occupation change & out-city move	0.3%	0.3%
Employer change within city	6.8%	7.6%
Employer change & in-city move	0.6%	0.5%
Employer change & out-city move	0.6%	0.5%

Table A7: Statistics on transitions within the dataset over time (number of observations)

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
Rural to urban move	2,841	1,615	2,029	1,281	2,257	1,494
Urban to rural move	2,929	1,789	2,100	1,328	2,165	1,555
Employer change	21,758	16,797	15,054	12,224	18,318	17,319
% employer change	7.9%	8.5%	7.2%	7.5%	9.1%	10.5%
Occupation change	18,744	13,013	20,532	15,088	13,464	11,647
% occupation change	6.8%	6.6%	9.8%	9.2%	6.7%	7.0%
Employer & occupation change	8,633	6,533	6,290	5,026	7,911	7,267
% occ change also employer change	46.1%	50.2%	30.6%	33.3%	58.8%	62.4%
Employer change & in-city move	1,194	661	965	660	1,276	915
Employer change & out-city move	1,221	759	959	622	1,220	900
% rural to urban move also employer change	42.0%	40.9%	47.6%	51.5%	56.5%	61.2%
% urban to rural move also employer change	41.7%	42.4%	45.7%	46.8%	56.4%	57.9%
Occ change & in-city move	718	397	590	391	683	478
Occ change & out-city move	684	426	546	396	673	474
% rural to urban move also occ change	25.3%	24.6%	29.1%	30.5%	30.3%	32.0%
% urban to rural move also occ change	23.4%	23.8%	26.0%	29.8%	31.1%	30.5%
Occ upgrade & in-city move	399	229	313	205	425	289
% rural to urban move also occ upgrade	14.0%	14.2%	15.4%	16.0%	18.8%	19.3%
Occ downgrade and out-city move	297	180	234	185	318	216
% urban to rural move also occ downgrade	10.1%	10.1%	11.1%	13.9%	14.7%	13.9%
Observations	276,839	197,792	209,033	163,836	200,762	165,576

Table A8: Urban/rural differences in average TTWA characteristics over time

	2007		2019	
	Rural	Urban	Rural	Urban
occupational diversity	22.37	32.75	23.06	32.86
industrial diversity	31.04	38.65	28.87	34.81
share of high skill population	26.90	27.38	36.55	38.25
employer concentration	0.008	0.002	0.009	0.003
Number of TTWA	225	70	225	70

Table A9: Summary statistics by mover status – males

	Non-movers	Movers		
	Mean	Mean	diff.	t-stat
Age	41.47	40.09	1.385***	(30.67)
% aged 18-24	0.09	0.10	-0.00978***	(-9.14)
% aged 25-34	0.24	0.26	-0.0209***	(-12.93)
% aged 35-44	0.26	0.27	-0.0190***	(-11.48)
% aged 45-65	0.42	0.37	0.0497***	(26.62)
Managers and Senior Officials	0.17	0.21	-0.0389***	(-27.16)
Professional Occupations	0.13	0.13	0.00136	(1.06)
Associate Professional and Technical Occupations	0.12	0.13	-0.0141***	(-11.49)
Administrative and Secretarial Occupations	0.07	0.07	0.000733	(0.78)
Skilled Trades Occupations	0.15	0.13	0.0255***	(18.92)
Personal Service Occupations	0.02	0.02	0.00317***	(5.53)
Sales and Customer Service Occupations	0.07	0.08	-0.00619***	(-6.37)
Process, Plant and Machine Operatives	0.14	0.12	0.0179***	(13.66)
Elementary Occupations	0.13	0.12	0.0106***	(8.28)
SIC 0	0.01	0.01	0.00386***	(9.84)
SIC 1	0.04	0.04	-0.00330***	(-4.46)
SIC 2	0.13	0.10	0.0253***	(20.05)
SIC 3	0.08	0.06	0.0155***	(15.62)
SIC 4	0.08	0.10	-0.0222***	(-21.29)
SIC 5	0.23	0.23	-0.00592***	(-3.73)
SIC 6	0.16	0.18	-0.0236***	(-17.13)
SIC 7	0.17	0.19	-0.0176***	(-12.29)
SIC 8	0.07	0.05	0.0223***	(23.42)
SIC 9	0.04	0.04	0.00584***	(7.84)
Part-time	0.08	0.06	0.0167***	(16.61)
Collective agreement	0.39	0.38	0.00227	(1.23)
Basic hourly earnings	13.57	13.60	-0.0359	(-1.11)
City	0.79	0.54	0.246***	(154.25)
Small City	0.35	0.29	0.0580***	(32.27)
Big City	0.28	0.20	0.0837***	(49.59)
London	0.15	0.05	0.104***	(79.20)
Works in TTWA of residence	0.66	0.42	0.244***	(127.53)
Rural to urban move		0.10		
Urban to rural move		0.11		
Employer change	0.09	0.17	-0.0876***	(-73.15)
Occupation change	0.09	0.13	-0.0414***	(-35.15)
Wage growth (%)	6.04	6.75	-0.714***	(-8.88)
In-city wage growth		10.99		
Out-city wage growth		8.41		
No skills	0.13	0.12	0.00519***	(4.13)
Low skill	0.32	0.31	0.00714***	(4.04)
Intermediate skill	0.29	0.30	-0.00261	(-1.51)
High skill	0.26	0.27	-0.00973***	(-5.86)
TTWA occupational diversity	36.43	34.49	1.942***	(51.48)
TTWA industrial diversity	37.60	36.58	1.014***	(39.43)
TTWA employer concentration	0.002786	0.0040	-0.00118***	(-61.66)
Observations	607918	78716	686634	
% observations	0.89	0.11		

Table A10: Summary statistics by mover status – females

	Non-movers	Movers		
	Mean	Mean	diff.	t-stat
Age	41.16	38.66	2.500***	(42.03)
% aged 18-24	0.10	0.14	-0.0366***	(-24.10)
% aged 25-34	0.23	0.26	-0.0381***	(-18.40)
% aged 35-44	0.24	0.25	-0.0104***	(-4.96)
% aged 45-65	0.43	0.34	0.0851***	(35.09)
Managers and Senior Officials	0.10	0.14	-0.0413***	(-27.23)
Professional Occupations	0.09	0.09	0.00593***	(4.20)
Associate Professional and Technical Occupations	0.10	0.12	-0.0155***	(-10.28)
Administrative and Secretarial Occupations	0.28	0.24	0.0318***	(14.50)
Skilled Trades Occupations	0.02	0.01	0.000943	(1.54)
Personal Service Occupations	0.10	0.09	0.0119***	(8.03)
Sales and Customer Service Occupations	0.18	0.18	-0.00914***	(-4.88)
Process, Plant and Machine Operatives	0.03	0.02	0.00583***	(7.20)
Elementary Occupations	0.10	0.09	0.00960***	(6.45)
SIC 0	0.00	0.01	-0.000328	(-0.95)
SIC 1	0.03	0.03	-0.00204**	(-2.64)
SIC 2	0.05	0.05	0.00367***	(3.43)
SIC 3	0.02	0.02	0.00690***	(9.35)
SIC 4	0.03	0.04	-0.00879***	(-11.00)
SIC 5	0.29	0.31	-0.0177***	(-7.93)
SIC 6	0.12	0.17	-0.0517***	(-31.91)
SIC 7	0.18	0.18	0.000975	(0.52)
SIC 8	0.23	0.17	0.0581***	(28.42)
SIC 9	0.05	0.04	0.0109***	(9.83)
Part-time	0.38	0.31	0.0717***	(30.16)
Collective agreement	0.37	0.38	-0.00781***	(-3.29)
Basic hourly earnings	10.79	10.69	0.106**	(3.29)
City	0.78	0.52	0.262***	(125.89)
Small City	0.34	0.27	0.0704***	(30.42)
Big City	0.28	0.19	0.0925***	(42.23)
London	0.16	0.06	0.0989***	(56.44)
Works in TTWA of residence	0.77	0.52	0.250***	(112.19)
Rural to urban move		0.11		
Urban to rural move		0.12		
Employer change	0.10	0.20	-0.105***	(-63.82)
Occupation change	0.09	0.14	-0.0561***	(-36.41)
Wage growth (%)	6.22	6.99	-0.763***	(-6.74)
In-city wage growth		10.31		
Out-city wage growth		6.76		
No skills	0.10	0.11	-0.000513	(-0.34)
Low skill	0.60	0.57	0.0294***	(12.22)
Intermediate skill	0.13	0.16	-0.0239***	(-14.26)
High skill	0.16	0.16	-0.00499**	(-2.77)
TTWA occupational diversity	35.81	33.92	1.884***	(40.02)
TTWA industrial diversity	37.10	36.12	0.983***	(29.64)
TTWA employer concentration	0.0028	0.0040	-0.00116***	(-44.37)
Observations	481984	45220	527204	
% observations	91.4%	8.6%		

Table A11: Standardised coefficients

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
City	0.018**[a]	0.046***	0.022**	0.022**	0.022**	0.025**
	(0.008)	(0.008)	(0.009)	(0.010)	(0.009)	(0.011)
Observations	276,839	197,792	209,033	163,836	200,762	165,576
R^2	0.302	0.290	0.157	0.134	0.242	0.165
Mean of dependent variable	0.182	-0.254	0.162	-0.207	0.136	-0.164
N workers	58,264	44,352	57,940	48,002	52,929	45,110

Dependent variable: basic hourly earnings. Non-categorical variables are standardised. All specifications include worker and job characteristics and year, industry, occupation and worker fixed effects. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A12: Splitting the pre-crisis period

		Male				Female			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1999-2004	City	0.180***	0.100***[a]	0.011**[b]	0.009*[b]	0.182***	0.117***	0.026***	0.024***
		(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)	(0.006)
	Observations	183,104	183,104	183,104	183,104	126,879	126,879	126,879	126,879
	R^2	0.038	0.533	0.326	0.326	0.056	0.557	0.340	0.340
	Mean of dependent variable	2.291	2.291	2.291	2.291	2.014	2.014	2.014	2.014
	N workers			46,704	46,704			34,453	34,453
2002-2007	City	0.178***	0.096***[a]	0.011***[a]	0.009**[b]	0.183***	0.113***	0.031***	0.024***
		(0.005)	(0.003)	(0.004)	(0.004)	(0.005)	(0.003)	(0.005)	(0.006)
	Observations	190,562	190,562	190,562	190,562	139,747	139,747	139,747	139,747
	R^2	0.031	0.543	0.296	0.297	0.047	0.560	0.315	0.315
	Mean of dependent variable	2.395	2.395	2.395	2.395	2.136	2.136	2.136	2.136
	N workers			51,665	51,665			39,266	39,266
	Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Worker and job characteristics		Yes	Yes	Yes		Yes	Yes	Yes
	Industry dummies		Yes	Yes	Yes		Yes	Yes	Yes
	Occupation dummies		Yes	Yes	Yes		Yes	Yes	Yes
	Worker fixed effects			Yes	Yes			Yes	Yes
	TTWA characteristics				Yes				Yes

Dependent variable: ln basic hourly earnings. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A13: TTWA size as independent variable – over time

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Ln TTWA employment	0.008***[a]	0.015***	0.009***	0.009***	0.010***	0.013***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	276,839	197,792	209,033	163,836	200,762	165,576
R^2	0.399	0.413	0.209	0.202	0.336	0.264
Mean of dependent variable	2.342	2.078	2.507	2.295	2.565	2.402
N workers	58,264	44,352	57,940	48,002	52,929	45,110

Dependent variable: log basic hourly earnings. All specifications include worker and job characteristics and year, industry, occupation and worker fixed effects. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A14: Gross hourly earnings as dependent variable – over time

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
City	0.014***[b]	0.027***	0.016***	0.016***	0.007*[b]	0.020***
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)
Observations	273,768	195,890	206,668	162,469	198,439	164,221
R^2	0.359	0.369	0.164	0.170	0.294	0.249
Mean of dependent variable	2.403	2.116	2.560	2.327	2.610	2.429
N workers	58,022	44,205	57,563	47,770	52,603	44,962

Dependent variable: ln gross hourly earnings. All specifications include worker and job characteristics and year, industry, occupation and worker fixed effects. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A15: Including TTWA characteristics

		Male				Female			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1999-2007	City	0.011***[a]	0.012***[a]	0.012***[a]	0.011***[a]	0.028***	0.028***	0.028***	0.027***
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
	Industrial diversity (std)	0.002**			0.002**	0.000			0.000
		(0.001)			(0.001)	(0.001)			(0.001)
	Occupational diversity (std)		-0.001		-0.001		0.001		0.001
			(0.001)		(0.001)		(0.002)		(0.002)
	Employer concentration (std)			-0.000	0.000			-0.000	-0.000
				(0.000)	(0.000)			(0.000)	(0.000)
	Observations	276,839	276,839	276,839	276,839	197,792	197,792	197,792	197,792
	R^2	0.399	0.399	0.399	0.399	0.412	0.412	0.412	0.412
	Mean of dependent variable	2.342	2.342	2.342	2.342	2.078	2.078	2.078	2.078
	N workers	58,264	58,264	58,264	58,264	44,352	44,352	44,352	44,352
2008-2013	City	0.012***	0.011***	0.014***	0.010**	0.010**	0.009*	0.011**	0.006
		(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
	Industrial diversity (std)	0.004***			0.005***	0.005***			0.004***
		(0.001)			(0.001)	(0.001)			(0.001)
	Occupational diversity (std)		0.003***		0.003***		0.004***		0.004***
			(0.001)		(0.001)		(0.001)		(0.001)
	Employer concentration (std)			-0.000	0.002			-0.002*	-0.001
				(0.001)	(0.001)			(0.001)	(0.002)
	Observations	209,033	209,033	209,033	209,033	163,836	163,836	163,836	163,836
	R^2	0.209	0.209	0.209	0.209	0.201	0.201	0.201	0.201
	Mean of dependent variable	2.507	2.507	2.507	2.507	2.295	2.295	2.295	2.295
	N workers	57,940	57,940	57,940	57,940	48,002	48,002	48,002	48,002
2014-2019	City	0.010***	0.008**	0.009**	0.006	0.017***	0.012**	0.013***	0.010*
		(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
	Industrial diversity (std)	0.000			-0.001	-0.001			-0.003**
		(0.001)			(0.001)	(0.001)			(0.002)
	Occupational diversity (std)		0.002**		0.002**		0.003***		0.004***
			(0.001)		(0.001)		(0.001)		(0.001)
	Employer concentration (std)			-0.002*	-0.003**			-0.003**	-0.005***
				(0.001)	(0.001)			(0.001)	(0.002)
	Observations	200,762	200,762	200,762	200,762	165,576	165,576	165,576	165,576
	R^2	0.335	0.335	0.335	0.336	0.263	0.263	0.263	0.263
	Mean of dependent variable	2.565	2.565	2.565	2.565	2.402	2.402	2.402	2.402
	N workers	52,929	52,929	52,929	52,929	45,110	45,110	45,110	45,110

Dependent variable: ln basic hourly earnings. All estimations include worker and job characteristics, year indicators and worker fixed effects. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A16: Urban wage premium without work moves only

	All years		2002-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
City	0.019***	0.024***	0.014***[a]	0.039***	0.020***	0.019***	0.013***	0.020***
	(0.003)	(0.004)	(0.005)	(0.007)	(0.005)	(0.006)	(0.005)	(0.006)
Observations	544,417	425,026	173,376	127,055	190,098	149,230	180,943	148,741
R^2	0.461	0.424	0.314	0.330	0.219	0.209	0.349	0.273
Mean of dependent variable	2.488	2.283	2.390	2.132	2.505	2.293	2.565	2.402
N workers	103,764	86,388	51,665	39,266	57,227	47,327	52,019	44,330

Dependent variable: ln basic hourly earnings. Observations where the worker has moved work postcodes but not home postcodes are excluded from the estimations. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A17: urban wage premium controlling for commuting distance

	All years		2002-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
City	0.016***	0.021***	0.012***[a]	0.030***	0.014***	0.013***	0.009**	0.016***
	(0.002)	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)
Observations	589,759	461,155	186,200	136,284	205,683	161,256	197,876	163,615
R^2	0.445	0.409	0.297	0.316	0.209	0.200	0.335	0.263
Mean of dependent variable	2.493	2.288	2.398	2.140	2.508	2.296	2.566	2.403
N workers	103,229	85,992	51,139	38,850	57,484	47,645	52,698	44,943

Dependent variable: ln basic hourly earnings. All estimations control for commuting distance. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A18: Urban wage premium controlling for worked hours

	All years		2002-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
City	0.015***[c]	0.022***	0.011***[a]	0.028***	0.014***	0.013***	0.011***	0.016***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
Observations	686,634	527,204	276,839	197,792	209,033	163,836	200,762	165,576
R^2	0.495	0.460	0.423	0.422	0.231	0.216	0.354	0.292
Mean of dependent variable	2.458	2.247	2.342	2.078	2.507	2.295	2.565	2.402
N workers	110,363	91,474	58,264	44,352	57,940	48,002	52,929	45,110

Dependent variable: ln basic hourly earnings. All estimations control for hours worked. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A19: Summary statistics of females over time

	1999-2007	2008-2013			2014-2019		
	mean	mean	diff.	t-stat	mean	diff.	t-stat
Age	41.29	40.72	0.572***	(14.36)	40.76	-0.0423	(-0.99)
% aged 18-24	0.09	0.11	-0.0234***	(-23.24)	0.12	-0.00384***	(-3.44)
% aged 25-34	0.23	0.22	0.00293*	(2.10)	0.24	-0.0160***	(-10.90)
% aged 35-44	0.26	0.25	0.0147***	(10.08)	0.21	0.0321***	(21.92)
% aged 45-65	0.42	0.42	0.00583***	(3.54)	0.43	-0.0123***	(-7.14)
Managers and Senior Officials	0.13	0.11	0.0204***	(18.71)	0.08	0.0346***	(34.30)
Professional Occupations	0.07	0.09	-0.0269***	(-29.98)	0.12	-0.0235***	(-22.01)
Associate Professional and Technical Occupations	0.10	0.11	-0.0184***	(-18.08)	0.11	0.00475***	(4.33)
Administrative and Secretarial Occupations	0.33	0.25	0.0870***	(57.43)	0.23	0.0163***	(10.99)
Skilled Trades Occupations	0.02	0.01	0.00258***	(6.09)	0.01	0.000694	(1.66)
Personal Service Occupations	0.07	0.11	-0.0322***	(-34.12)	0.13	-0.0253***	(-22.51)
Sales and Customer Service Occupations	0.16	0.19	-0.0272***	(-21.41)	0.18	0.0145***	(10.75)
Process, Plant and Machine Operatives	0.04	0.02	0.0157***	(27.04)	0.02	0.00221***	(4.36)
Elementary Occupations	0.08	0.10	-0.0209***	(-21.84)	0.13	-0.0243***	(-21.88)
SIC 0	0.00	0.00	0.000187	(0.82)	0.01	-0.000700**	(-2.85)
SIC 1	0.03	0.02	0.00847***	(15.69)	0.02	0.000306	(0.60)
SIC 2	0.07	0.04	0.0210***	(27.45)	0.04	0.00659***	(9.55)
SIC 3	0.03	0.02	0.0111***	(21.35)	0.02	-0.0000496	(-0.10)
SIC 4	0.02	0.03	-0.00553***	(-10.24)	0.03	0.00241***	(4.14)
SIC 5	0.27	0.31	-0.0386***	(-25.58)	0.30	0.00964***	(6.02)
SIC 6	0.16	0.11	0.0443***	(38.65)	0.10	0.0167***	(15.69)
SIC 7	0.18	0.18	0.00226	(1.76)	0.18	-0.0012	(-0.90)
SIC 8	0.19	0.23	-0.0361***	(-26.69)	0.26	-0.0290***	(-19.46)
SIC 9	0.05	0.05	-0.00712***	(-9.68)	0.06	-0.00469***	(-5.80)
Part-time	0.36	0.38	-0.0175***	(-10.85)	0.38	-0.00545**	(-3.22)
Collective agreement	0.47	0.33	0.133***	(82.07)	0.28	0.0530***	(33.03)
Basic hourly earnings	9.08	11.22	-2.140***	(-105.43)	12.38	-1.162***	(-48.36)
City	0.76	0.76	0.000298	(0.21)	0.75	0.00353*	(2.36)
Small City	0.33	0.34	-0.00568***	(-3.61)	0.33	0.00257	(1.56)
Big City	0.28	0.27	0.00143	(0.96)	0.27	0.00183	(1.18)
London	0.15	0.15	0.00454***	(3.80)	0.15	-0.000864	(-0.70)
Works in TTWA of residence	0.75	0.75	0.00648***	(4.11)	0.75	0.00056	(0.37)
Mover	0.09	0.09	-0.000651	(-0.69)	0.08	0.00694***	(7.16)
Rural to urban move	0.01	0.01	0.00108**	(2.93)	0.01	-0.000717	(-1.94)
Urban to rural move	0.01	0.01	0.00187***	(4.87)	0.01	-0.000785*	(-2.09)
Employer change	0.11	0.09	0.0194***	(17.35)	0.12	-0.0286***	(-24.77)
Occupation change	0.08	0.11	-0.0265***	(-24.02)	0.08	0.0319***	(29.00)
% wage growth	7.33	4.91	2.422***	(33.29)	6.48	-1.577***	(-19.59)
In-city wage growth	12.09	7.70	4.389***	(4.48)	10.64	-2.938**	(-2.73)
Out-city wage growth	6.98	6.12	0.863	(0.93)	7.04	-0.921	(-0.88)
No skills	0.07	0.11	-0.0360***	(-37.97)	0.14	-0.0305***	(-26.58)
Low skill	0.63	0.59	0.0429***	(26.40)	0.57	0.0171***	(9.94)
Intermediate skill	0.14	0.14	0.00443***	(3.84)	0.13	0.00912***	(7.75)
High skill	0.15	0.17	-0.0113***	(-9.26)	0.16	0.00429***	(3.33)
TTWA occupational diversity	40.32	33.12	7.196***	(209.78)	32.55	0.570***	(35.37)
TTWA industrial diversity	40.56	35.70	4.859***	(222.67)	34.09	1.608***	(87.30)
TTWA employer concentration	0.0029	0.0028	0.000153***	(8.17)	0.0031	-0.000309***	(-20.87)
Observations	197792		163836		165576		

Table A20: Summary statistics of males over time

	1999-2007	2008-2013			2014-2019		
	mean	mean	diff.	t-stat	mean	diff.	t-stat
Age	42.19	40.90	1.292***	(37.96)	40.54	0.360***	(9.52)
% aged 18-24	0.07	0.10	-0.0291***	(-37.09)	0.11	-0.00946***	(-10.05)
% aged 25-34	0.22	0.24	-0.0148***	(-12.13)	0.26	-0.0219***	(-16.21)
% aged 35-44	0.27	0.26	0.0112***	(8.75)	0.23	0.0296***	(21.96)
% aged 45-65	0.44	0.40	0.0326***	(22.81)	0.40	0.00176	(1.15)
Managers and Senior Officials	0.22	0.17	0.0486***	(42.17)	0.11	0.0603***	(55.58)
Professional Occupations	0.12	0.14	-0.0169***	(-17.56)	0.15	-0.0112***	(-10.31)
Associate Professional and Technical Occupations	0.10	0.13	-0.0226***	(-24.64)	0.13	-0.00451***	(-4.31)
Administrative and Secretarial Occupations	0.07	0.06	0.0120***	(16.73)	0.07	-0.00626***	(-8.30)
Skilled Trades Occupations	0.16	0.14	0.0241***	(23.01)	0.13	0.00810***	(7.54)
Personal Service Occupations	0.02	0.02	-0.00341***	(-8.17)	0.03	-0.00541***	(-10.93)
Sales and Customer Service Occupations	0.05	0.08	-0.0268***	(-37.88)	0.09	-0.00735***	(-8.52)
Process, Plant and Machine Operatives	0.15	0.13	0.0216***	(21.30)	0.13	0.00339**	(3.24)
Elementary Occupations	0.10	0.13	-0.0366***	(-39.87)	0.17	-0.0370***	(-32.99)
SIC 0	0.01	0.01	0.000996***	(3.31)	0.01	-0.000404	(-1.27)
SIC 1	0.05	0.04	0.00857***	(14.85)	0.04	0.000775	(1.33)
SIC 2	0.16	0.11	0.0517***	(51.71)	0.10	0.0121***	(12.72)
SIC 3	0.09	0.07	0.0210***	(26.96)	0.06	0.00312***	(4.06)
SIC 4	0.08	0.09	-0.00584***	(-7.23)	0.08	0.0101***	(11.69)
SIC 5	0.20	0.24	-0.0477***	(-40.04)	0.25	-0.00897***	(-6.64)
SIC 6	0.16	0.15	0.00468***	(4.44)	0.16	-0.00491***	(-4.32)
SIC 7	0.16	0.18	-0.0201***	(-18.51)	0.18	0.00127	(1.05)
SIC 8	0.06	0.07	-0.00657***	(-9.34)	0.08	-0.0122***	(-15.02)
SIC 9	0.04	0.04	-0.00664***	(-11.85)	0.04	-0.000899	(-1.42)
Part-time	0.05	0.09	-0.0366***	(-50.94)	0.10	-0.0137***	(-15.02)
Collective agreement	0.47	0.35	0.119***	(83.73)	0.32	0.0298***	(20.26)
Basic hourly earnings	12.15	14.24	-2.088***	(-87.07)	14.83	-0.588***	(-21.18)
City	0.76	0.76	-0.00369**	(-2.99)	0.75	0.00781***	(5.84)
Small City	0.34	0.34	-0.0000928	(-0.07)	0.34	0.000137	(0.09)
Big City	0.28	0.27	0.00291*	(2.25)	0.27	0.000363	(0.26)
London	0.14	0.15	-0.00651***	(-6.42)	0.14	0.00731***	(6.69)
Works in TTWA of residence	0.63	0.63	0.00145	(0.95)	0.64	-0.0136***	(-9.08)
Mover	0.11	0.12	-0.00843***	(-9.06)	0.11	0.0122***	(12.25)
Rural to urban move	0.01	0.01	0.00153***	(4.35)	0.01	-0.00100**	(-2.77)
Urban to rural move	0.01	0.01	0.00153***	(4.29)	0.01	-0.0000977	(-0.27)
Employer change	0.10	0.09	0.0146***	(15.72)	0.10	-0.0166***	(-17.06)
Occupation change	0.09	0.12	-0.0303***	(-31.73)	0.07	0.0416***	(42.52)
% wage growth	7.17	4.85	2.325***	(36.61)	6.10	-1.249***	(-20.52)
In-city wage growth	12.63	9.02	3.603***	(3.32)	10.69	-1.664*	(-2.02)
Out-city wage growth	8.80	6.92	1.878*	(2.29)	9.35	-2.432**	(-2.64)
No skills	0.07	0.14	-0.0629***	(-72.23)	0.18	-0.0475***	(-41.48)
Low skill	0.32	0.32	0.000726	(0.54)	0.33	-0.0130***	(-8.87)
Intermediate skill	0.33	0.28	0.0500***	(37.39)	0.26	0.0210***	(15.13)
High skill	0.28	0.27	0.0122***	(9.42)	0.23	0.0395***	(29.35)
TTWA occupational diversity	40.98	33.31	7.671***	(251.49)	32.66	0.648***	(46.27)
TTWA industrial diversity	40.94	35.95	4.987***	(263.32)	34.30	1.648***	(101.66)
TTWA employer concentration	0.00	0.00	0.000163***	(10.41)	0.00	-0.000319***	(-25.88)
Observations	276839	209033			200762		

Table A21: Urban wage premium by occupation group

		All years	1999-2007	2008-2013	2014-2019
		(1)	(2)	(3)	(4)
Managers and Senior Officials	City	0.009	0.011*	0.002	0.016
		(0.006)	(0.007)	(0.009)	(0.011)
	Cityxfemale	0.015	0.015	0.002	0.017
		(0.010)	(0.013)	(0.017)	(0.019)
	Observations	174,942	86,539	53,725	34,678
	R^2	0.407	0.358	0.155	0.258
	Mean dependent variable	2.805	2.711	2.867	2.944
	N workers	37,938	22,681	19,150	10,807
Professional Occupations	City	0.020**	0.008	0.033*	0.013
		(0.008)	(0.013)	(0.017)	(0.010)
	Cityxfemale	-0.001	0.020	-0.006	-0.028
		(0.014)	(0.024)	(0.025)	(0.022)
	Observations	138,593	46,054	43,677	48,862
	R^2	0.473	0.417	0.264	0.317
	Mean dependent variable	2.896	2.767	2.929	2.989
	N workers	28,764	11,638	15,345	14,406
Associate Professional and Technical Occupations	City	0.015**	0.027**	0.008	0.003
		(0.006)	(0.012)	(0.008)	(0.011)
	Cityxfemale	-0.008	-0.006	-0.010	0.002
		(0.011)	(0.019)	(0.015)	(0.022)
	Observations	137,133	47,644	45,109	44,380
	R^2	0.494	0.432	0.258	0.380
	Mean dependent variable	2.625	2.486	2.653	2.746
	N workers	34,668	14,621	17,619	14,709
Administrative and Secretarial Occupations	City	0.021**	0.032***	-0.002	0.003
		(0.008)	(0.011)	(0.014)	(0.016)
	Cityxfemale	0.002	-0.003	-0.003	0.033
		(0.010)	(0.013)	(0.018)	(0.020)
	Observations	189,637	85,660	52,740	51,237
	R^2	0.457	0.458	0.195	0.235
	Mean dependent variable	2.237	2.070	2.322	2.429
	N workers	42,287	22,496	18,777	16,280
Skilled Trades Occupations	City	0.020***	0.008	0.021*	0.022**
		(0.006)	(0.008)	(0.012)	(0.010)
	Cityxfemale	-0.026	-0.012	0.006	-0.045*
		(0.023)	(0.051)	(0.035)	(0.024)
	Observations	110,024	49,126	31,889	29,009
	R^2	0.483	0.412	0.215	0.388
	Mean dependent variable	2.285	2.136	2.363	2.452
	N workers	23,378	12,408	10,815	8,993
Personal Service Occupations	City	0.012	-0.000	0.043	0.006
		(0.013)	(0.032)	(0.027)	(0.014)
	Cityxfemale	0.011	0.024	-0.033	0.010
		(0.015)	(0.036)	(0.031)	(0.019)
	Observations	69,464	19,955	22,120	27,389
	R^2	0.313	0.297	0.114	0.229
	Mean dependent variable	2.052	1.835	2.089	2.180
	N workers	17,932	6,569	8,085	9,095
Sales and Customer Service Occupations	City	-0.003	0.006	-0.013	0.003
		(0.007)	(0.013)	(0.012)	(0.009)
	Cityxfemale	0.016*	0.011	0.020	-0.008
		(0.009)	(0.015)	(0.014)	(0.014)
	Observations	141,400	46,916	47,867	46,617
	R^2	0.411	0.318	0.214	0.283
	Mean dependent variable	1.989	1.801	2.001	2.165
	N workers	35,401	14,541	17,541	15,881
Process, Plant and Machine Operatives	City	0.017***	0.019**	0.018*	0.004
		(0.006)	(0.009)	(0.011)	(0.009)
	Cityxfemale	-0.016	-0.003	-0.031	-0.002
		(0.014)	(0.025)	(0.033)	(0.019)
	Observations	109,537	49,670	30,976	28,891
	R^2	0.445	0.366	0.152	0.309
	Mean dependent variable	2.138	1.968	2.225	2.336
	N workers	23,836	12,907	10,584	8,764
Elementary Occupations	City	0.013***	0.021**	-0.003	0.011
		(0.005)	(0.010)	(0.008)	(0.007)
	Cityxfemale	-0.005	-0.018	0.021*	-0.004
		(0.007)	(0.017)	(0.012)	(0.011)
	Observations	143,108	43,067	44,766	55,275
	R^2	0.395	0.315	0.176	0.317
	Mean dependent variable	2.003	1.809	2.004	2.155
	N workers	37,367	13,887	17,007	18,152

Dependent variable: ln basic hourly earnings. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%.

Table A22: Urban wage premium by industry group

		All years	1999-2007	2008-2013	2014-2019
		(1)	(2)	(3)	(4)
SIC 0	City	-0.013	0.004	-0.005	-0.087
		(0.023)	(0.036)	(0.042)	(0.053)
	Cityxfemale	-0.035	-0.051	-0.043	0.044
		(0.046)	(0.063)	(0.082)	(0.085)
	Observations	10,034	4,084	2,915	3,035
	R^2	0.494	0.413	0.222	0.352
	Mean dependent variable	2.111	1.917	2.181	2.305
	N workers	2,087	1,010	884	934
SIC 1	City	0.012	-0.006	0.007	0.021
		(0.011)	(0.013)	(0.016)	(0.019)
	Cityxfemale	0.011	0.010	0.035	-0.034
		(0.029)	(0.041)	(0.026)	(0.026)
	Observations	40,671	18,569	11,286	10,816
	R^2	0.484	0.389	0.236	0.310
	Mean dependent variable	2.256	2.117	2.341	2.407
	N workers	8,600	4,866	3,572	3,278
SIC 2	City	0.006	-0.002	0.008	0.007
		(0.008)	(0.009)	(0.013)	(0.013)
	Cityxfemale	0.027*	0.060***	0.013	0.008
		(0.016)	(0.020)	(0.035)	(0.023)
	Observations	113,473	57,539	30,143	25,791
	R^2	0.516	0.429	0.252	0.349
	Mean dependent variable	2.387	2.255	2.479	2.573
	N workers	22,025	13,689	9,315	7,612
SIC 3	City	-0.007	-0.027*	-0.012	0.034**
		(0.009)	(0.014)	(0.016)	(0.016)
	Cityxfemale	0.012	0.013	0.047	-0.064**
		(0.021)	(0.025)	(0.051)	(0.027)
	Observations	62,848	30,086	16,948	15,814
	R^2	0.593	0.488	0.344	0.405
	Mean dependent variable	2.463	2.295	2.564	2.675
	N workers	11,931	7,214	5,016	4,400
SIC 4	City	0.006	0.015	-0.006	0.001
		(0.006)	(0.010)	(0.010)	(0.010)
	Cityxfemale	0.030**	0.007	0.034	0.008
		(0.015)	(0.022)	(0.021)	(0.033)
	Observations	71,181	27,617	23,333	20,231
	R^2	0.490	0.442	0.197	0.340
	Mean dependent variable	2.472	2.297	2.539	2.632
	N workers	14,250	7,540	7,066	5,979
SIC 5	City	0.004	0.002	-0.001	0.001
		(0.005)	(0.008)	(0.008)	(0.007)
	Cityxfemale	0.004	0.014	0.002	0.007
		(0.007)	(0.011)	(0.011)	(0.009)
	Observations	308,759	107,430	101,304	100,025
	R^2	0.447	0.376	0.206	0.313
	Mean dependent variable	2.131	1.986	2.151	2.266
	N workers	65,083	29,419	31,579	30,787
SIC 6	City	0.017***	0.012**	0.019***	0.008
		(0.005)	(0.006)	(0.007)	(0.009)
	Cityxfemale	0.008	0.003	-0.018	-0.011
		(0.008)	(0.010)	(0.012)	(0.016)
	Observations	173,619	75,054	50,712	47,853
	R^2	0.546	0.461	0.292	0.345
	Mean dependent variable	2.527	2.401	2.608	2.641
	N workers	31,503	17,288	15,310	13,613
SIC 7	City	0.020***	0.011	0.028***	0.009
		(0.006)	(0.011)	(0.010)	(0.009)
	Cityxfemale	0.009	0.039**	-0.018	-0.001
		(0.010)	(0.018)	(0.015)	(0.014)
	Observations	213,706	80,482	67,234	65,990
	R^2	0.444	0.389	0.205	0.313
	Mean dependent variable	2.524	2.386	2.580	2.635
	N workers	50,072	23,979	22,869	21,726
SIC 8	City	0.027**	0.003	0.050**	0.017
		(0.011)	(0.022)	(0.021)	(0.018)
	Cityxfemale	-0.013	-0.002	-0.049**	-0.002
		(0.013)	(0.026)	(0.024)	(0.022)
	Observations	163,510	54,313	51,054	58,143
	R^2	0.436	0.433	0.164	0.214
	Mean dependent variable	2.400	2.259	2.429	2.506
	N workers	31,559	12,985	15,998	16,716
SIC 9	City	0.006	0.027	-0.024	0.015
		(0.015)	(0.027)	(0.023)	(0.024)
	Cityxfemale	-0.014	-0.023	0.006	-0.045
		(0.022)	(0.041)	(0.034)	(0.041)
	Observations	56,037	19,457	17,940	18,640
	R^2	0.391	0.372	0.182	0.238
	Mean dependent variable	2.307	2.153	2.351	2.426
	N workers	13,148	5,652	6,050	6,158

Dependent variable: ln basic hourly earnings. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%.

Table A23: Urban transitions and wage growth, with TTWA characteristics

	1999-2007		2008-2013		2014-2019	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Urban stayer	0.003***	0.002***	0.003***	0.002***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Incity	0.021***	0.023***	0.017***[c]	0.003	0.018***	0.012*
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Outcity	0.003[a]	-0.020***	0.003	0.000	0.015***[a]	-0.008
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Observations	218,575	153,440	176,893	135,546	180,803	146,744
R^2	0.034	0.035	0.042	0.040	0.052	0.042
Mean of dependent variable	0.0547	0.0566	0.0370	0.0368	0.0477	0.0465

Dependent variable: Δ ln basic hourly earnings. All specifications include first differenced worker, job and TTWA characteristics and industry, occupation and year indicators. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A24: The urban wage premium over time, using the sample of Table 10

		Male			Female		
		(1)	(2)	(3)	(4)	(5)	(6)
1999-2007	City	0.180***	0.097***[a]	0.012***[b]	0.183***	0.115***	0.028***
		(0.005)	(0.003)	(0.004)	(0.005)	(0.003)	(0.005)
	Observations	218,575	218,575	218,575	153,440	153,440	153,440
	R2	0.045	0.539	0.361	0.068	0.570	0.378
	Mean of dependent variable	2.380	2.380	2.380	2.113	2.113	2.113
	N workers			54,516			41,023
2008-2013	City	0.166***	0.087***[a]	0.018***	0.176***	0.101***	0.016***
		(0.005)	(0.004)	(0.005)	(0.005)	(0.003)	(0.006)
	Observations	176,893	176,893	176,893	135,546	135,546	135,546
	R2	0.019	0.525	0.194	0.028	0.544	0.187
	Mean of dependent variable	2.538	2.538	2.538	2.317	2.317	2.317
	N workers			52,770			43,076
2014-2019	City	0.141***	0.073***	0.011***	0.147***	0.078***	0.014**
		(0.005)	(0.003)	(0.004)	(0.005)	(0.003)	(0.005)
	Observations	180,803	180,803	180,803	146,744	146,744	146,744
	R2	0.022	0.523	0.313	0.034	0.528	0.242
	Mean of dependent variable	2.591	2.591	2.591	2.423	2.423	2.423
	N workers			52,790			44,899
	Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
	Worker and job characteristics		Yes	Yes		Yes	Yes
	Industry dummies		Yes	Yes		Yes	Yes
	Occupation dummies		Yes	Yes		Yes	Yes
	Worker fixed effects			Yes			Yes

Dependent variable: ln basic hourly earnings. The set of observations is the same as in Table 10. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%. Levels of significance of the gender difference in coefficients: a 1%; b 5%; c 10%.

Table A25: Expected changes in wages during job transitions

	Expected change in wage		1999-2007	2008-2013	2014-2019
Male	In-city and occupation upgrade	Mean	0.68	0.68	0.66
		N	399	313	425
	Out-city and occupation downgrade	Mean	-0.31	-0.35	-0.32
		N	297	234	318
Female	In-city and occupation upgrade	Mean	0.82	0.69	0.78
		N	229	205	289
	Out-city and occupation downgrade	Mean	-0.38	-0.39	-0.37
		N	180	185	216

This table provides the expected change in employee wages based on 1999 mean occupational wages (by sex and urban-rural status) and observed occupation changes during job transitions into and out of cities.

Table A26: urban wage premium by skill group

		All years	1999-2007	2008-2013	2014-2019
		(1)	(2)	(3)	(4)
No skills	City	0.003	0.011	0.007	0.003
		(0.005)	(0.011)	(0.008)	(0.007)
	Cityxfemale	0.005	0.004	0.012	0.002
		(0.008)	(0.019)	(0.014)	(0.011)
	Observations	141,525	34,942	46,475	60,108
	R^2	0.467	0.380	0.252	0.363
	Mean dependent variable	2.032	1.802	2.021	2.175
	N workers	27,327	9,255	14,156	16,454
Low skilled	City	0.019***	0.019***	0.010	0.006
		(0.004)	(0.006)	(0.006)	(0.006)
	Cityxfemale	0.001	0.006	-0.001	0.015*
		(0.005)	(0.008)	(0.009)	(0.009)
	Observations	537,484	213,258	163,023	161,203
	R^2	0.493	0.441	0.225	0.285
	Mean dependent variable	2.141	1.976	2.189	2.309
	N workers	90,461	46,075	47,100	43,553
Intermediate skilled	City	0.016***	0.006	0.013*	0.014*
		(0.004)	(0.006)	(0.007)	(0.008)
	Cityxfemale	0.016*	0.029**	0.016	0.009
		(0.008)	(0.013)	(0.015)	(0.015)
	Observations	273,095	119,188	80,855	73,052
	R^2	0.492	0.416	0.218	0.348
	Mean dependent variable	2.474	2.319	2.547	2.646
	N workers	43,415	24,686	22,302	19,352
High skilled	City	0.019***	0.012*	0.028***	0.023***
		(0.005)	(0.007)	(0.009)	(0.009)
	Cityxfemale	0.012	0.026*	-0.014	-0.017
		(0.010)	(0.015)	(0.017)	(0.018)
	Observations	261,734	107,243	82,516	71,975
	R^2	0.423	0.362	0.191	0.267
	Mean dependent variable	2.897	2.785	2.948	3.007
	N workers	40,634	22,600	22,384	18,680

Dependent variable: ln basic hourly earnings. Skill levels are measured from the two-digit occupation code in the first year the worker is observed. Robust clustered standard errors in parentheses. Levels of significance: *** 1%; ** 5%; * 10%.

A generally accepted stylised fact on the urban wage premium is that it only affects white collar workers or more educated workers (Gould, 2007). I investigate if women may differ from men in the role of skills in the urban wage premium. For better tractability, I estimate fully interacted models where the gender difference is shown by the coefficient on *City x Female*. These estimations are conducted on separate samples of workers, according to the occupation-based skill category assigned to them in the first year they are observed.

The results in column (2) of Table A26 indicate that the higher urban wage premium for women in the pre-crisis period is driven by intermediate and high-skilled workers. There is no longer a gender difference in these skill groups from the Financial Crisis onwards (columns (3) and (4)). In line with most of the literature, there is almost no evidence for an urban wage premium in the groups with "no skills" or low skills, for women or men.

Re-evaluating the urban wage premium: the changing roles of geographical and job transitions for women and men

June 2024

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Highlights

- Women's urban wage premium was larger than men's until the Financial Crisis.
- Since then, it has dropped and remained at the same level as men.
- This is due to women no longer benefiting from sharing advantages in cities.
- Women's wages drop when they switch occupation while moving to a rural job.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: