Introduction	Methods 00000	Results	Discussion	

Occupational Segregation and Earnings Differentials between Women and Men: Evidence from the UK Labour Force Survey

Peter Dutey-Magni

Geography / Social Statistics University of Southampton

LFS User Meeting, 10 December 2012

Introduction		Discussion	Summary	

Outline

Introduction

Methods

Results

Discussion

▲□ → < □ → < □ → < □ → < □ → < □ → < □ → < □ → < □ → </p>
LFS User Meeting, 10 December 2012

p.dutey-magni@soton.ac.uk

Introduction	Methods 00000	Results 0000	Discussion	
Introduction				

Descriptives

Descriptive statistics are the main tools at our service:

Index of dissimilarity If k is the industrial sector, division or group drawn from an industrial classification containing K such headings:

$$D = \frac{1}{2} \times \sum_{k=1}^{K} \left| \frac{N_k^f}{N^f} - \frac{N_k^m}{N^m} \right|$$

Yet, such statistics have important limitations.

Fig. 1. – Duncan's dissimilarity index across industries Source: LFS 1975-1990 ; QLFS 1992-2012



SQ (P

Fig. 2. – Dissimilarity index across occupations Source: LFS 1975-1990 ; QLFS 1992-2012



Introduction	Methods 00000	Results 0000	Discussion	
Introduction				

Introduction

- Rising participation of (increasingly qualified) women in the labour market.

- Persistence of gender segregation across the board

- Persistence of a large unexplained inequality of earnings, along with the rise of wage dispersion.

Introduction	Methods 00000	Results 0000	Discussion	
Introduction				

Research questions

- Is it possible to measure how much of the gender pay gap is due to occupational segregation?
- To what extent is this estimate interpretable?

Focus on industrial sectors, with minor controls for occupational status.

Methods	Discussion	Summary	

Outline

Introduction

Methods

Results

Discussion



æ

イロン イロン イヨン イヨン

p.dutey-magni@soton.ac.uk

Introduction	Methods ●○○○○	Results 0000	Discussion	
Methods				

Model Random-effect model nesting individuals within *268 industrial groups*.

Data Quarterly Labour Force Survey (2009, Q1 – 2012, Q3), wave 1 only.

Response variable In(hourpay) (Self-reported gross hourly earnings).

Three models:

- A. Fixed effects.
- B. Random intercepts.
- C. Random gender effects.
- Modified Oaxaca-Blinder decomposition.
- Heckman 2-step correction for selection bias.

Introduction	Methods o●ooo	Results	Discussion	
Methods				

Explanatory variables (Level 1 only)

- Sex
- Age
- Months continuously employed
- Whether has children
- Whether works part-time
- Qualifications
- Whether works in the public sector
- Whether has a LLTI
- NS-SEC, 9 headings
- Sampling weights
- Heckman two-step
- interaction terms between gender and most covariates

Introduction	Methods ○○●○○	Results 0000	Discussion	
Methods				

Random effect models

Model specifications pooled wage regression with a gender dummy δ_{male} , an industrial-level random error term v_k and an individual-level random error term ε_{ik}

$$\begin{aligned} &\ln(W_{ik}) = \beta_0 + \beta_{male} \delta_{male} + \sum_{j=1}^{J} \left[\beta_j X_{ij} \right] + \upsilon_k + \varepsilon_{ik} \\ &\upsilon_k \sim N(0, \sigma_v^2) \qquad \varepsilon_{ik} \sim N(0, \sigma_\varepsilon^2) \qquad \textit{Cov}(\upsilon_k, \varepsilon_{ik}) = 0 \end{aligned}$$

Introduction	Methods ooo●o	Results	Discussion	
Methods				

Random effect models

Advantages compared to fixed-effect models:

- No reference category: assuming a latent overall tendency;
- Allows to break down industries into more categories, in order to capture the whole segregation effect (Kidd & Shannon, 1996);
- Men and women are treated together in variance components: addressing the identification issue?
- Used by Haberfeld et al. (1998) and De Ruijter & Huffman (2003).

Introduction	Methods ○○○○●	Results	Discussion	
Methods				

Oaxaca-Blinder decomposition: original method

2 separate OLS regressions are estimated. Male and female mean wages may then be expressed as follows:

$$\ln(\bar{W}^m) = \hat{\beta}_0^m + \sum_{j=1}^n \hat{\beta}_j^m \bar{X}_j^m \quad ; \quad \ln(\bar{W}^f) = \hat{\beta}_0^f + \sum_{j=1}^n \hat{\beta}_j^f \bar{X}_j^f$$

The pay gap is then decomposed:

$$\ln\left(\frac{\bar{W}^{m}}{\bar{W}^{f}}\right) = \ln(\bar{W}^{m}) - \ln(\bar{W}^{f})$$
$$= \underbrace{\sum_{j=1}^{n} \left[\hat{\beta}_{j}^{m}(\bar{X}_{j}^{m} - \bar{X}_{j}^{f})\right]}_{\text{Structural component}} + \underbrace{\sum_{j=1}^{n} \left[\bar{X}_{j}^{f}(\hat{\beta}_{j}^{m} - \hat{\beta}_{j}^{f})\right] + (\hat{\beta}_{0}^{m} - \hat{\beta}_{0}^{f})}_{\text{Returns component}}$$

	Results	Discussion	

Outline

Introduction

Methods

Results

Discussion



æ

<ロ> (日) (日) (日) (日) (日)

Introduction	Methods 00000	Results ●000	Discussion	
Results				

$\text{Model}\ \varnothing$

Variance partition

Levels	SIC headings	σ	S.E	% tot. var.
Level 4	Industry divisions (88 units)	0.042	(0.014)	12.8 %
Level 3	Industry group (272 units)	0.012	(0.005)	3.7 %
Level 2	Industry class (615 digits)	0.014	(0.003)	4.3 %
Level 1	Individual	0.258	(0.001)	79.2%

æ

イロン イロン イヨン イヨン

Introduction	Methods 00000	Results o●oo	Discussion	
Results				

Model A: OLS



Introduction	Methods 00000	Results ○○●○	Discussion	
Results				

Model B: Random intercepts



p.dutey-magni@soton.ac.uk

Introduction	Methods 00000	Results ooo●	Discussion	
Results				

Model C: Random gender effect



p.dutey-magni@soton.ac.uk

	Discussion	Summary	

Outline

Introduction

Methods

Results

Discussion



æ

イロン イロン イヨン イヨン

Introduction	Methods 00000	Results	Discussion •ooooo	
Discussion				

Model assumptions



Introduction	Methods 00000	Results 0000	Discussion o●oooo	
Discussion				

Definition:

$$corr(\varepsilon_i, X_i) \neq 0$$

Endogeneity leads to an identification problem.

- Often overlooked by the literature... unsurprisingly! Only Brown et al. (1980) use a self-selection correction. But it is found to do a poor job (Kidd & Shannon, 1996).
- 'it is quite possible that the sorting process of men and women into certain occupations is not exogenous to the earnings model' (Haberfeld et al., 1998, p. 109).
- Miller (1987) argues that occupations used as covariates raise an issue. It is taking people's distribution on the labour market for granted. This ignores pre-market discrimination, which may in turn miss on the actual drives for both occupational segregation and wage inequality.

Introduction	Methods 00000	Results 0000	Discussion	
Discussion				



æ

Introduction	Methods 00000	Results 0000	Discussion ○○○●○○	
Discussion				



æ

Introduction	Methods 00000	Results 0000	Discussion ○○○○●○	
Discussion				



Segregation in qualifications? Unequal aspirations? Unequal distribution of housework and childcare? Attitudes? Discrimination?

伺き くほき くほう

Introduction	Methods 00000	Results 0000	Discussion 00000●	
Discussion				

Interpretation

The contribution of u_k to the wage decomposition may be thought of as between-industry unobserved variation.

This is a 'magic wand' estimate, based on a series of assumptions.

Where this variation comes from is undetermined.

Implications: gender inequality, professional mobility, unequal exposure to economic conditions.

・ 同 ト ・ ヨ ト ・ ヨ ト

Introduction	Methods 00000	Results	Discussion	Summary ●○	
Summary					
Summary					

— One fourth of the earnings differential between women and men is associated with between-industry variations.

 This comes to saying that the estimated premium enjoyed by men due to relative segregation across industrial sectors is +5.7 % (including bias).

— This estimate is a theoretical one and does not account for second order effects.

In an ideal world:

- either the dissimilarity index is $0 \Leftrightarrow$ no segregation
- or the correlation between δ and u_k is 0 \Leftrightarrow neutral effect

・ 同 ト ・ ヨ ト ・ ヨ ト

Introduction 00000	Methods 00000	Results 0000	Discussion	Summary ⊙●	
Summary					

Further research

Addressing bias:

- Recognising the informative sampling design: within-household income correlation.

- Endogeneity and unobserved heterogeneity.

Adding controls: centralised bargaining, degree subject area, institutional factors.

Introduction	Methods 00000	Results 0000	Discussion	References
Summary				

Brown, R. S., Moon, M., & Zoloth, B. S. (1980). 'Occupational Attainment and Segregation by Sex', *The Journal of Human Resources*, 33(4), pp. 506-517.

- De Ruijter, J. M. & Huffman, M. L. (2003). 'Gender Composition Effects in the Netherlands: A Multilevel Analysis of Occupational Wage Inequality', *Social Science Research*, 32(2), pp. 312-334.
- Duncan, O. D. & Duncan, B. (1955). 'A Methodological Analysis of Segregation Indexes', American Sociological Review, 20(2), pp. 210-217.
- Fields, J., & Wolff, E. N. (1995). 'Interindustry Wage Differentials and the Gender Wage Gap', *Industrial & Labor Relations Review*, 49(1), pp. 105-120.
- Haberfeld, Y., Semyonov, M., & Addi, A. (1998). 'A Hierarchical Linear Model for Estimating Gender-Based Earnings Differentials', *Work and Occupations*, 25(1), pp. 97-112.
- Horrace, W. C., & Oaxaca, R. L. (2001). 'Inter-Industry Wage Differentials and the Gender Wage Gap: An Identification Problem', *Industrial and Labor Relations Review*, 54(3), pp. 611-618.

Introduction	Methods 00000	Results 0000	Discussion	References
Summary				

Kidd, M. P. & Shannon, M. (1996). 'Does the Level of Occupational Aggregation Affect Estimates of the Gender Wage Gap?', *Industrial and Labor Relations Review*, 49(2), pp. 317-329.

Miller, P. W. (1987). 'The Wage Effect of the Occupational Segregation of Women in Britain', *The Economic Journal*, 97(388), pp. 885-896.

O'Neill, J., & Polachek, S. W. (1993). 'Why the Gender Pay Gap Narrowed in the 1980s', *Journal of Labor Economics*, 11(1), pp. 205-228.

Smyth, E., & Steinmetz, S. (2008). 'Field of Study and Gender Segregation in European Labour Markets', *International Journal of Comparative Sociology*, 49(4-5), pp. 257-281.

Yun, M.-S. (2006). 'Revisiting Inter-Industry Wage Differentials and the Gender Wage Gap: An Identification Problem', *IZA Discussion Paper No 2427. Available online:* http://ftp.iza.org/dp2427.pdf [Accessed 22 November 2012].