Is this really a man's world? The effect of vertical and horizontal segregation

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"Income and wealth inequality: drivers and consequences"
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Background and motivation

Unexplained gender wage gap closely linked to occupational and sectoral segregation (Anker, 1998, Chzhen and Mumford, 2011, DiPrete and Buchmann, 2013, Goldin, 2014) :

- Cultural explanations (Cejka and Eagly, 1999, Charles and Bradley, 2009)
- Psycological traits (Gneezy et al., 2003, Niederle and Vesterlund, 2007, Buser et al., 2014)
- Preference-based explanations (Hakim, 2000, Redmond and McGuinness,2019)
- Differences in educational attainments (Polachek, 1981, Stohmeyer, 2007, Bertrand, 2017)

Research question

- Analyse the entire spectrum of gender driven differences in wage distribution
- Use the degree of female participation to explore the association between gender wage gap over the wage distribution and occupation types
- Exploit difference in vocational versus general qualifications to explore the association between gender gap over the wage distribution and educational background.

Contribution

- Grade transformation analysis and relative distribution methods to compare the wage distributions of males and females
- Focus on multiple dimensions: gender wage gap across the wage spectrum, gender-driven occupational segregation, and disparities in educational background.
- Explores the existence of any correlation between the type of educational background and gender differences throughout the wage distribution

Summary of the results

- Women in FD and M occupations end up facing the toughest glass ceiling effect. Women in MD occupation perform on average as well as men
- Vocational qualification: women face the wider wage gap in the upper part of the wage distribution in MD and M occupations.
- General qualification: women face the lowest glass in MD occupations.

Outline

- Methodology
- Data and Descriptive Statistics
- Results
- Robustness Checks
- Conclusion

Methodology

- Y_0: a random variable composed of male real hourly wages (reference population)
- $F_0(y)$, and $f_0(y)$: CDF and PDF - reference population.
- Y: a random variable composed of female real hourly wages (comparison population).
- F(y) and f(y): CDF and the PDF - comparison population.
- F and F_0 are assumed to be continuous with common support.

The relative distribution of Y (comparison) to Y_0 (reference) can be defined as the distribution of the random variable:

$$R = F_0(Y)$$

The PDF of R, known as the relative density:

$$g(r) = \frac{f(F_0^{-1}(r))}{f_0(F_0^{-1}(r))} = \frac{f(Q_0(r))}{f_0(Q_0(r))}$$

Data

Data: UK Labour Force Survey 2014-2019. Working-age adults (18-65).
Pooled across the years: analytical sample of 184,883 individuals, 95,646 women, and 89,237 men.

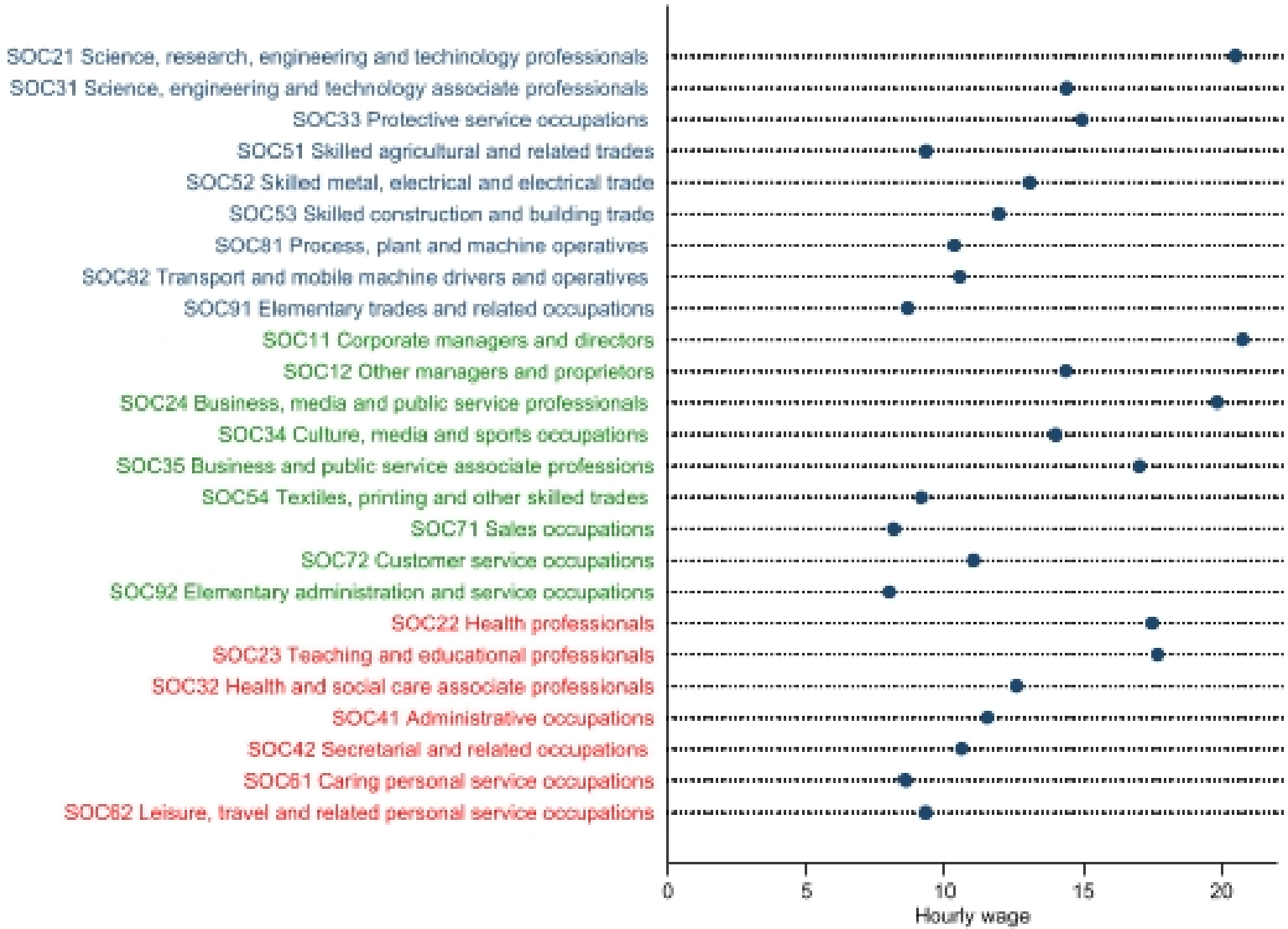
Outcome of interest: Rank of women's wage relative to men's wage

Key variables:

- Occupation type: Male-dominated (0-29.9 %) Mixed occupations (30-69.9 %) Female-dominated (70-100 %)
- Highest qualification achieved (Vocational Level 1-8, General level 1-8)

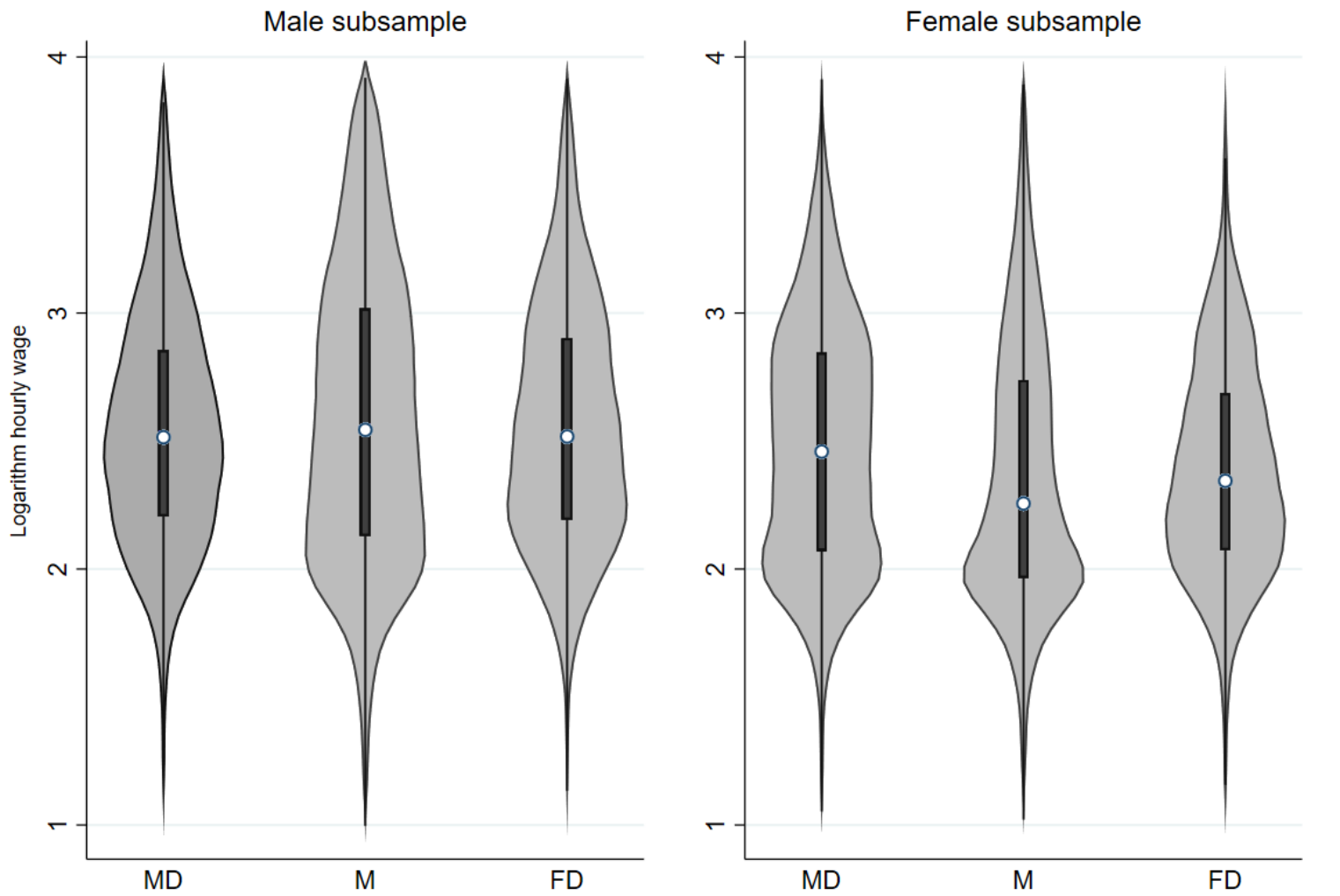
Data

Figure 1: Mean Hourly wage by occupation



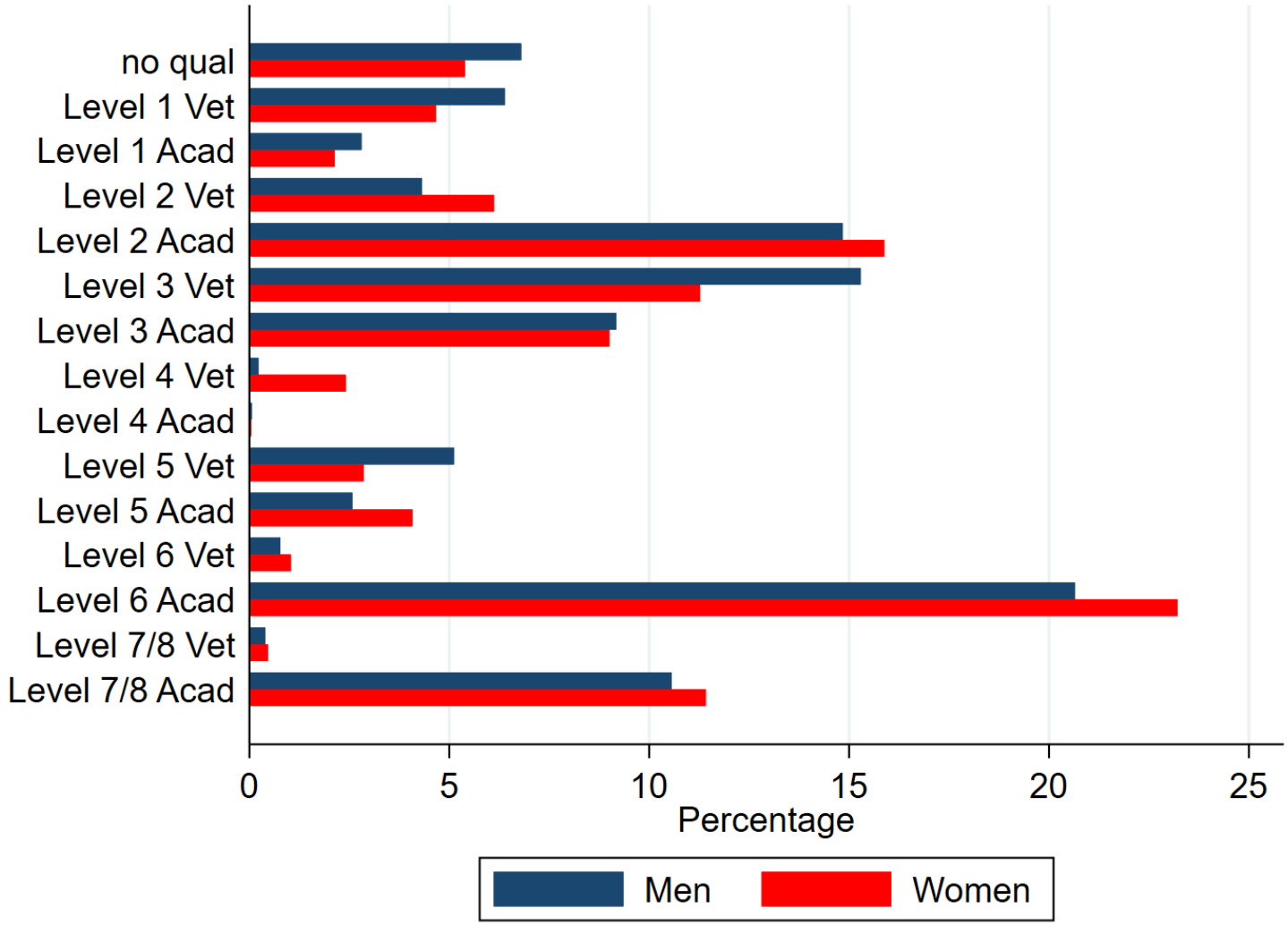
Data

Figure 2: Violin plot of the wage distribution by gender and across occupation



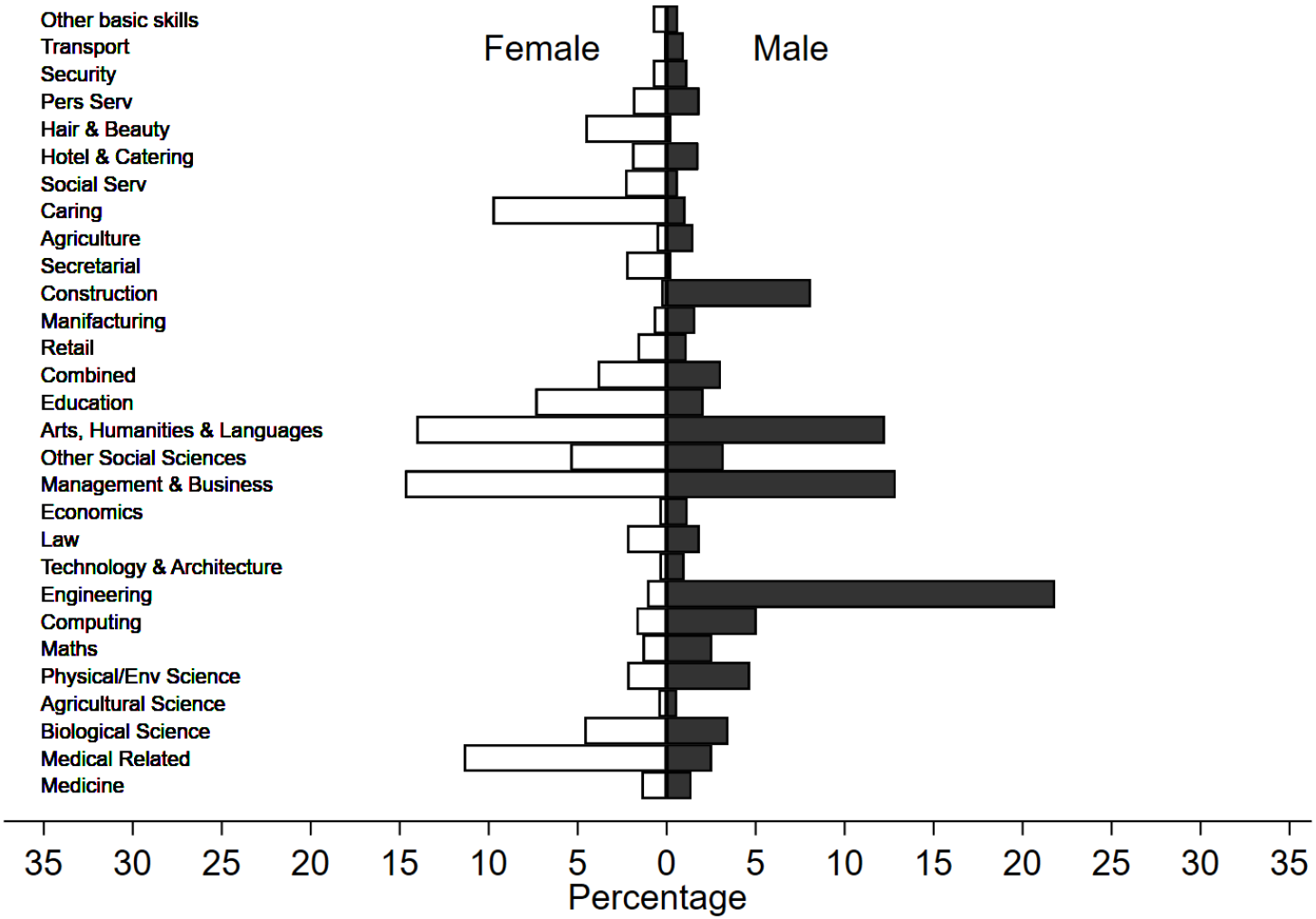
Data

Figure 3: Distribution of qualification among men and women



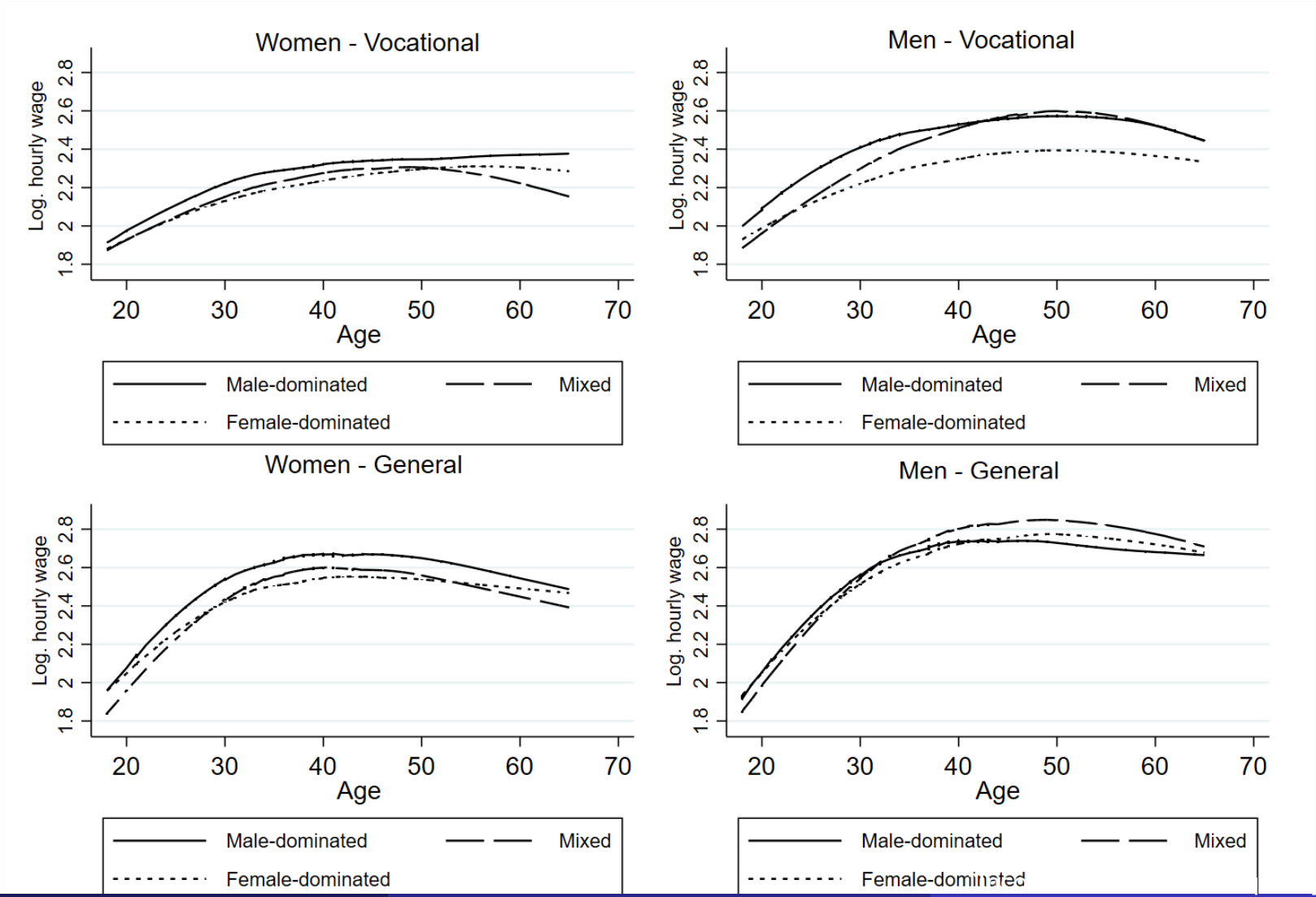
Data

Figure : Distribution of qualification by field of specialization among men and women



Data

Figure 5: Age-hourly wage relationship for women/men across education types

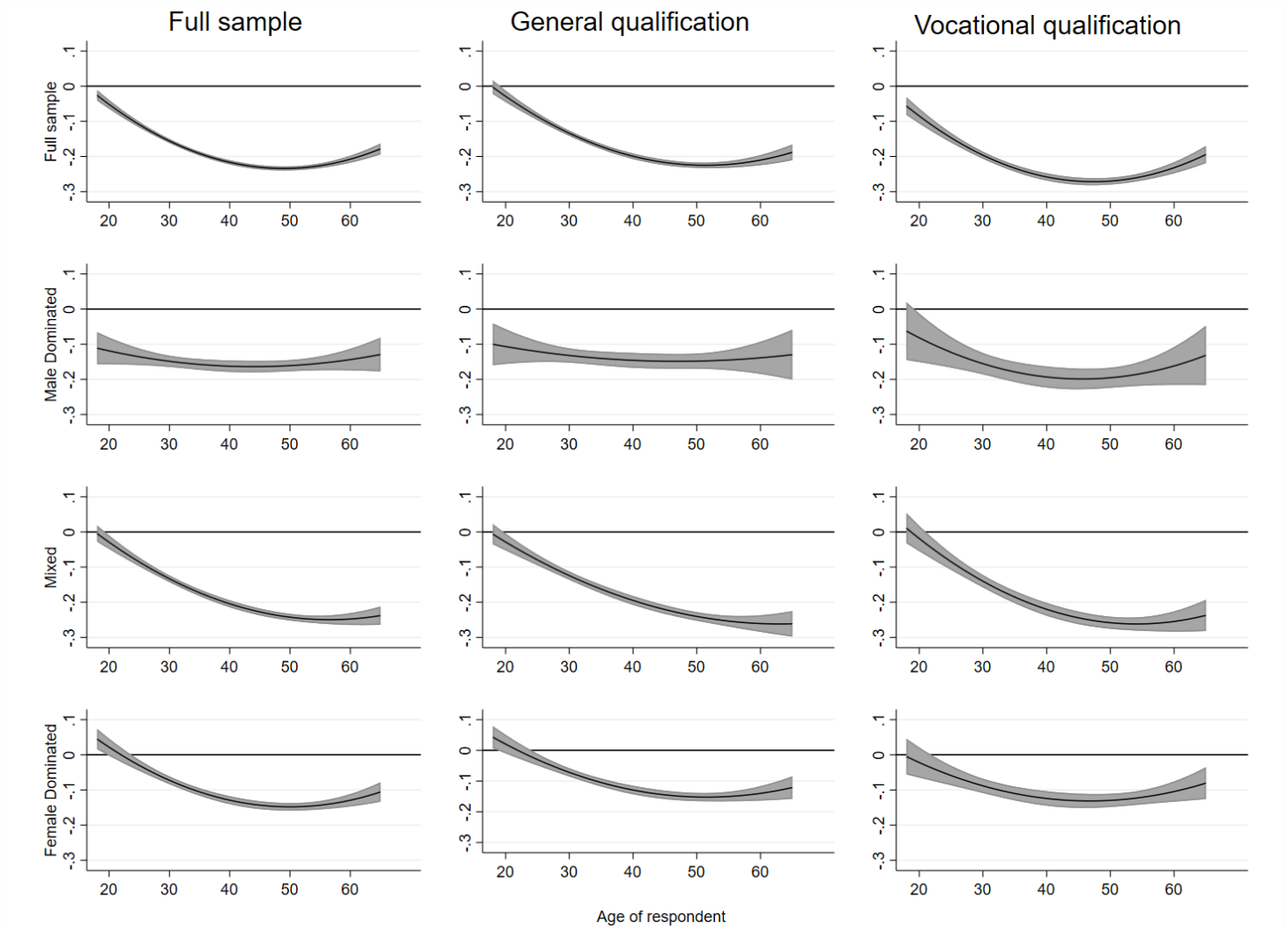


Data

Control variables:

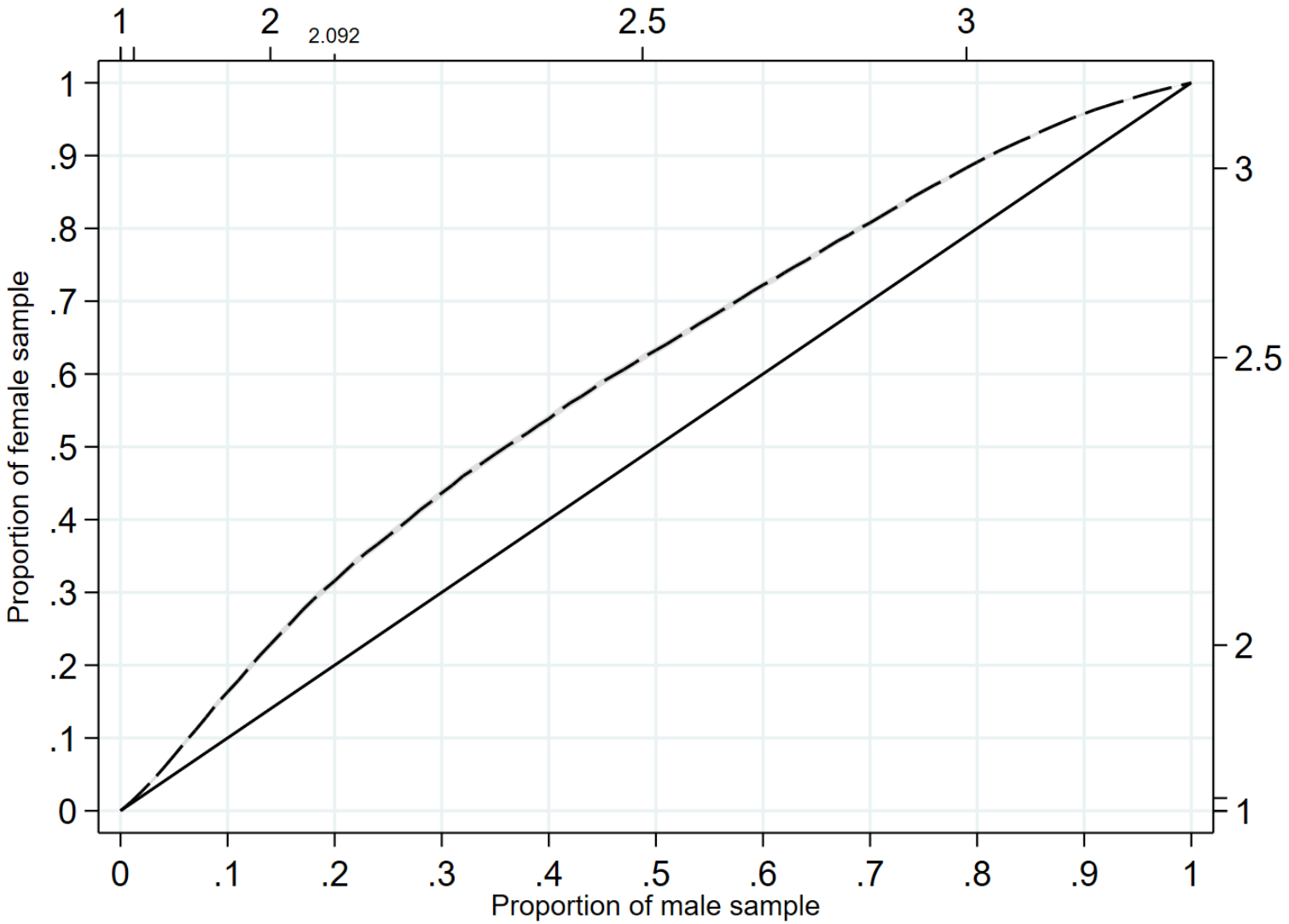
- Demographics: Gender, Ethnicity, Relationship status, Number of children, Geographic area
- Firm and Job characteristics: Firm size, Occupation, Public/Private company

Figure 6:Gender comparison of the adjusted mean of the logarithm of the hourly wage by education and occupation type



Results

Figure 7: Relative CDF



Results

Figure 8: Relative PDF

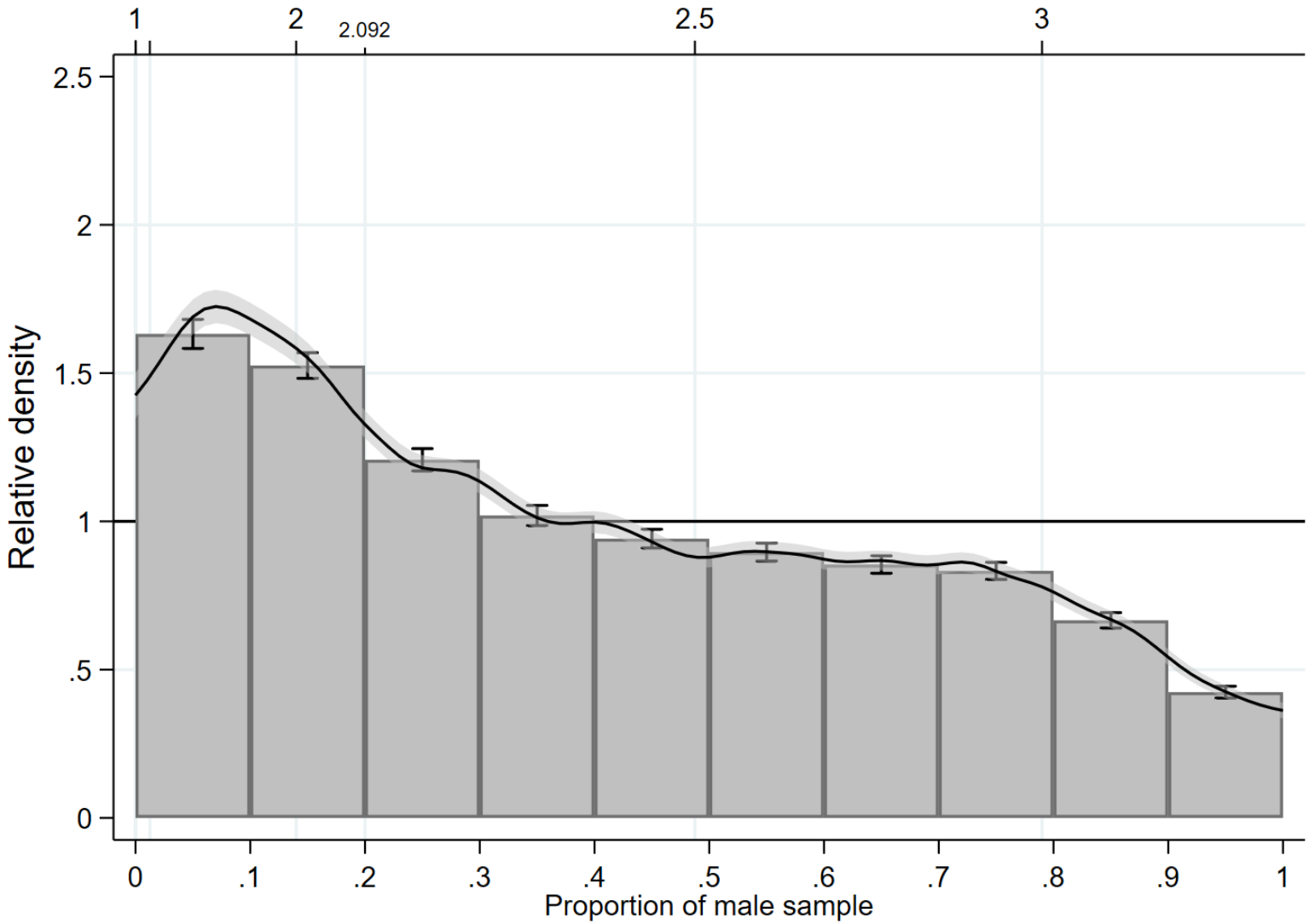


Figure 9: Relative PDF across occupation type

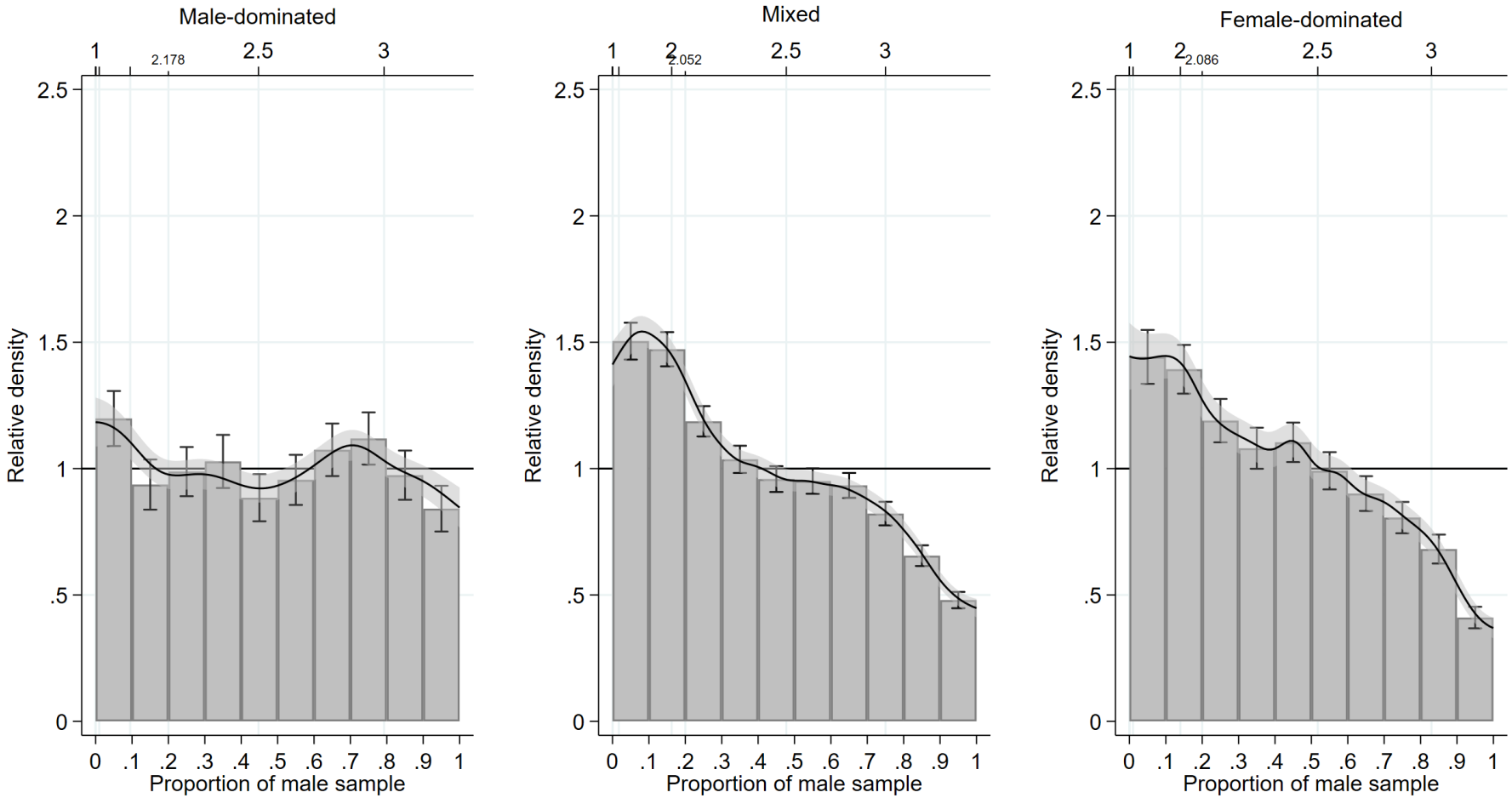
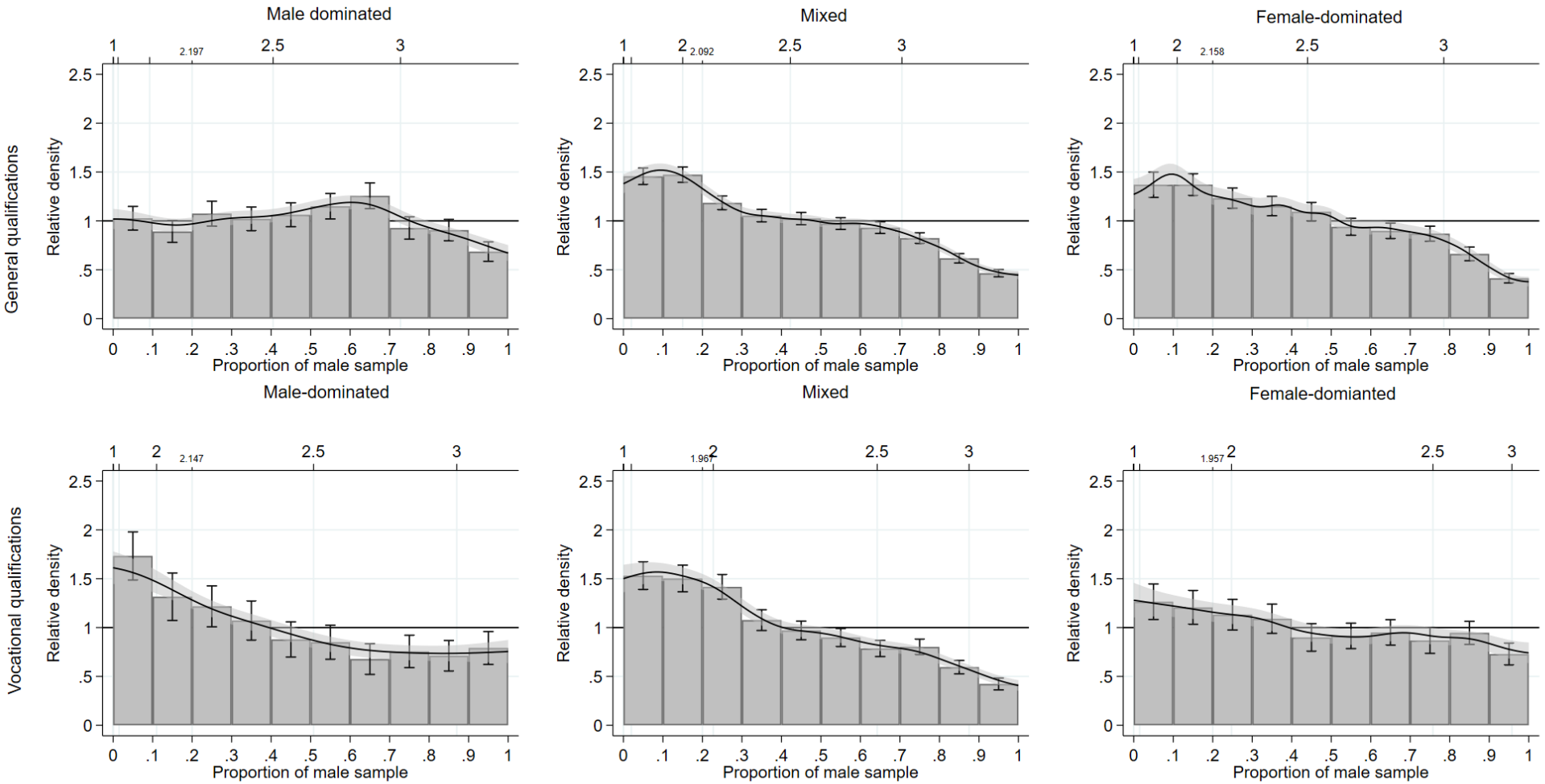
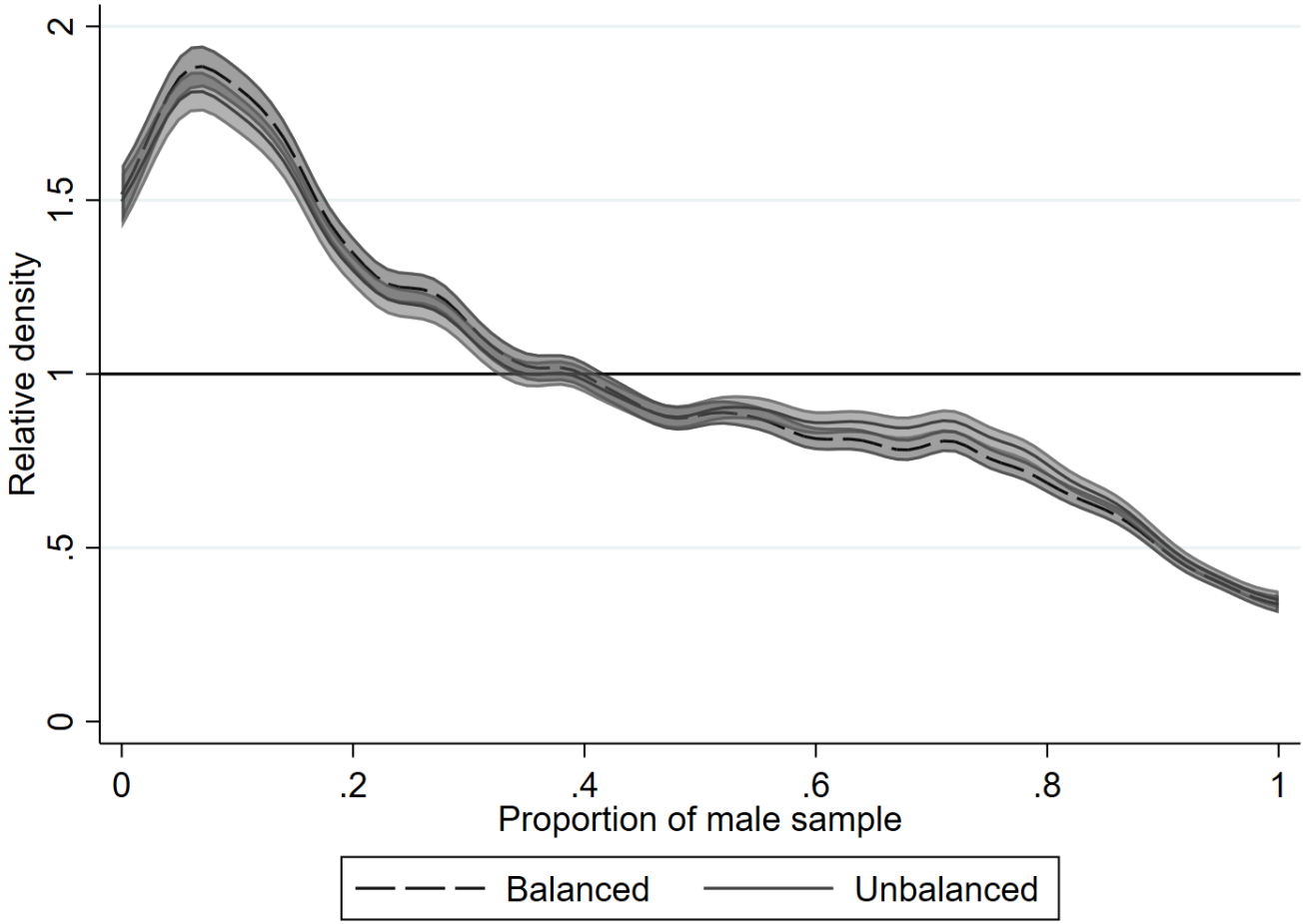


Figure 10: Relative PDF across occupation and education type



Results

Figure 11: Relative density balanced versus unbalanced data



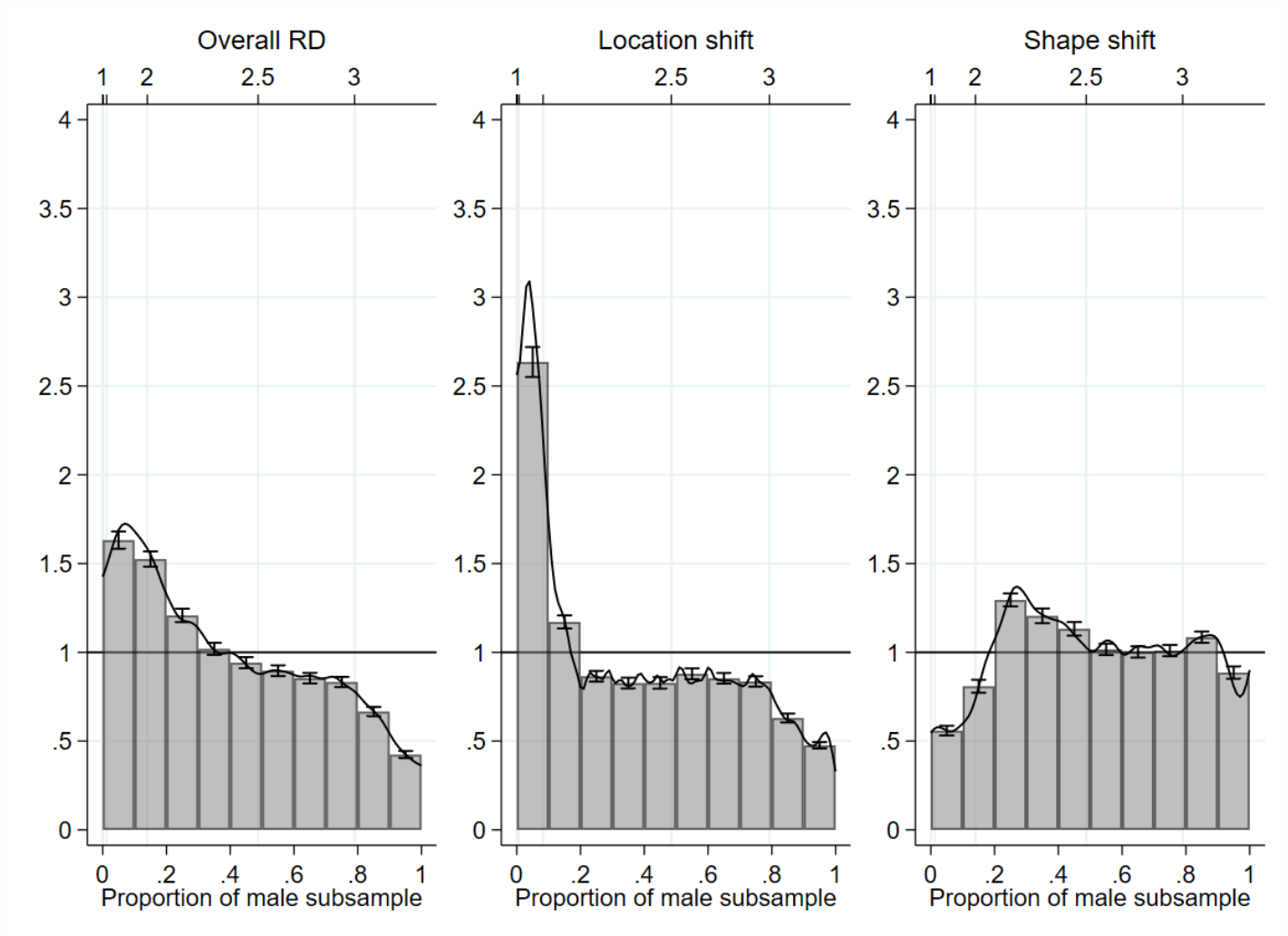
Robustness checks

- Location and shape decomposition
- Composition of background characteristics

$$R_{ijsq} = \beta_0 + \beta_1 Background_{ijsq} + \beta_2 Family_{ijsq} + \beta_3 Job_{ijsq} + \epsilon_{ijsq}$$

- Common Support
- Subject of the highest qualification achieved
- Weekly working hours

Robustness checks: Location and shape

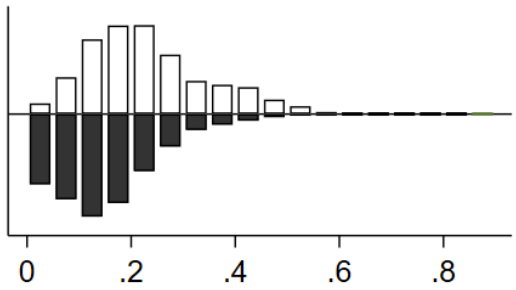


Robustness checks: Location and shape

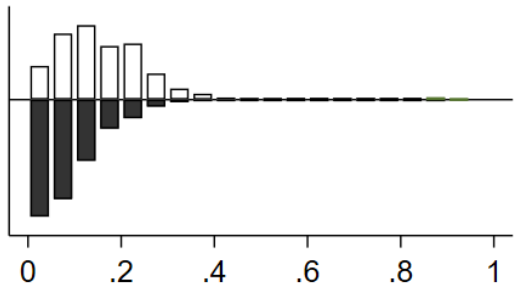
Log Hourly wage	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Location	61.019	2.390	25.53	0	56.334	65.703
Shape	38.980	2.390	16.31	0	34.296	43.665

Note: Labour Force Survey data 2014-2019. Working-age population (18-65) only. The test implemented is based on the comparison of the entropy (Kullback-Leibler divergence) of the unadjusted and adjusted relative distributions (Bernhardt et al, 1999).

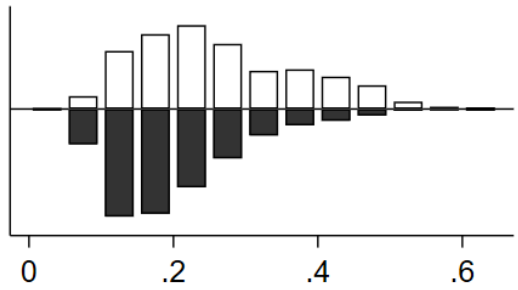
Robustness checks: Common Support Assumption



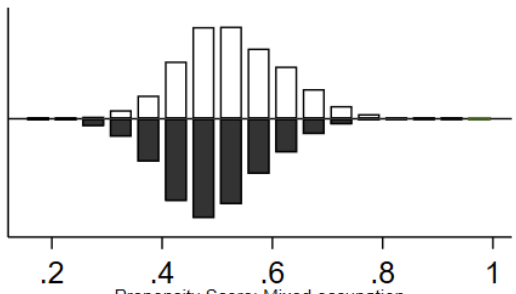
Propensity Score: Male dominated occupation



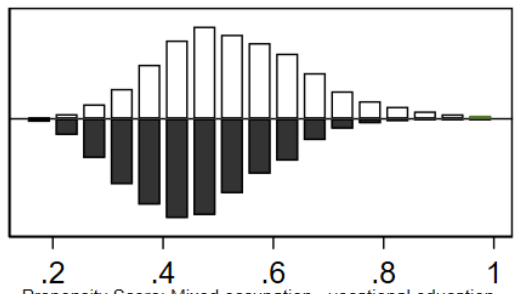
Propensity Score: Male dominated occupation- vocational education



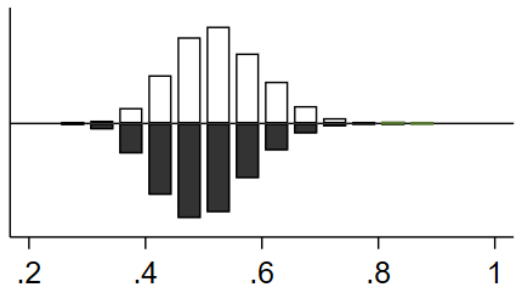
Propensity Score: Male dominated occupation - general education



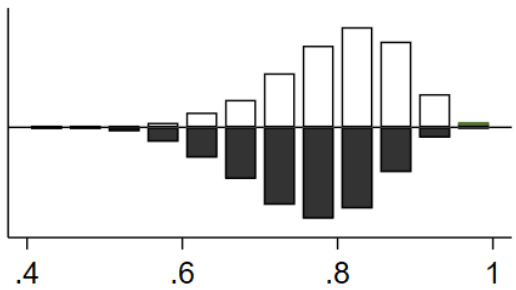
Propensity Score: Mixed occupation



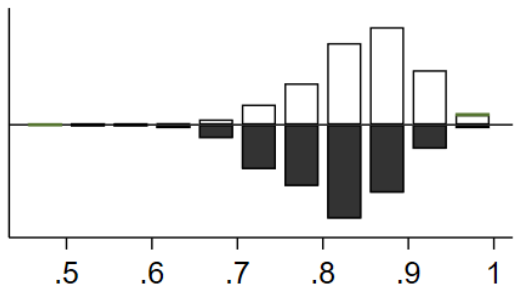
Propensity Score: Mixed occupation - vocational education



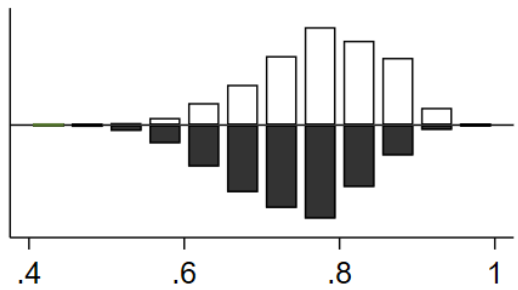
Propensity Score: Mixed occupation - general education



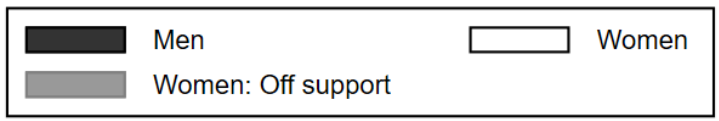
Propensity Score: Female dominated occupation



Propensity Score: Female dominated - vocational qualification



Propensity Score: Female dominated - general education



Conclusions

- Women in FD and M occupations end up facing the toughest glass ceiling effect. Women in MD occupation perform on average as well as men
- Vocational qualification: women face the wider wage gap in the upper part of the wage distribution in MD and M occupations.
- General qualification: women face the lowest glass ceiling in MD.

Table A.1: Occupation types

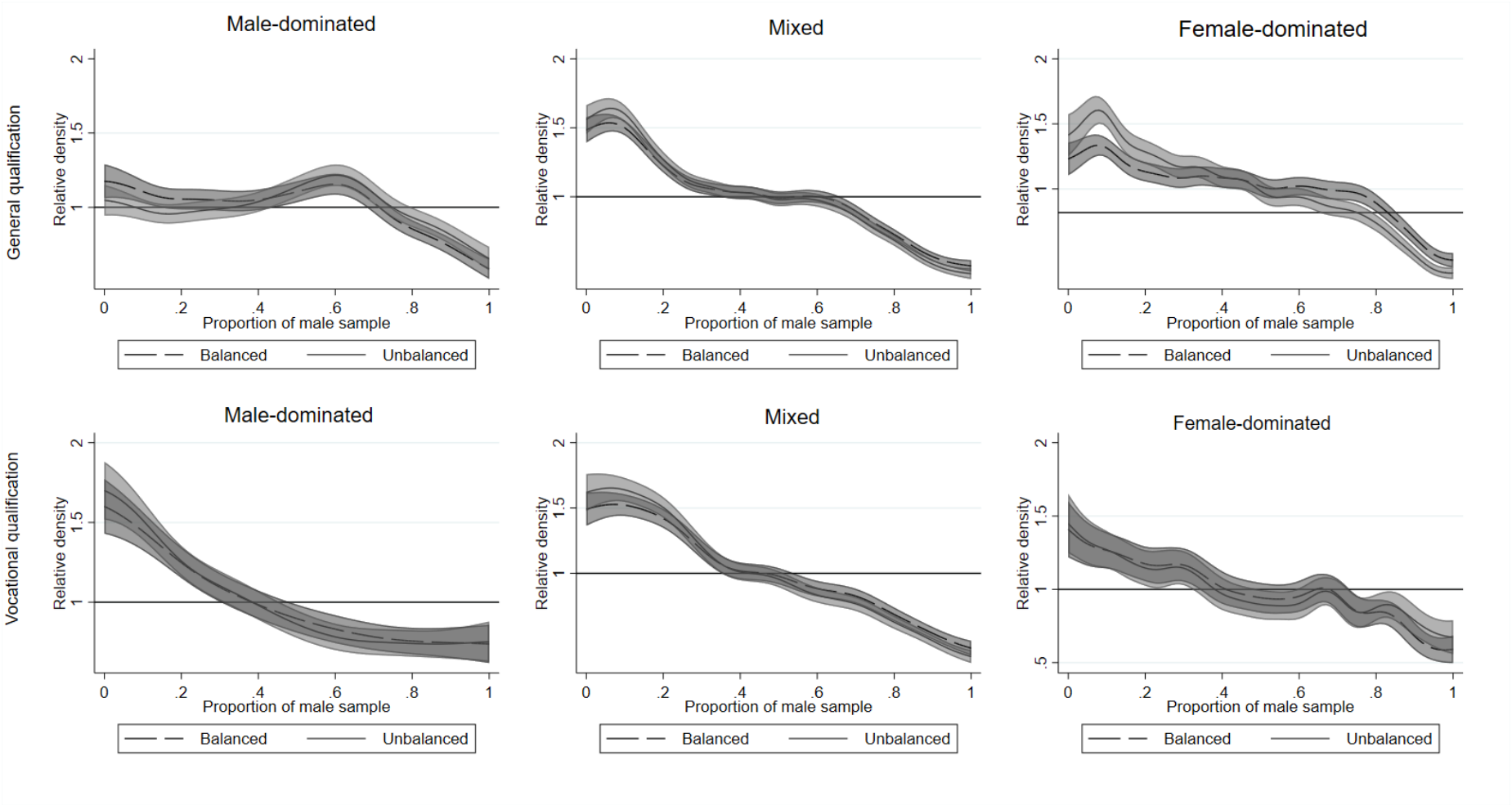
Male-dominated Occupations	Mixed Occupations	Female-dominated Occupations
SOC21 Science, research, engineering and technology professionals	SOC11 Corporate managers and directors	SOC22 Health professionals
SOC31 Science, engineering and technology associate professionals	SOC12 Other managers and proprietors	SOC23 Teaching and educational professionals
SOC33 Protective service occupations	SOC24 Business, media and public service professionals	SOC32 Health and social care associate professionals
SOC51 Skilled agricultural and related trades	SOC34 Culture, media and sports occupations	SOC41 Administrative occupations
SOC52 Skilled metal, electrical and electrical trade	SOC35 Business and public service associate professions	SOC42 Secretarial and related occupations
SOC53 Skilled construction and building trade	SOC54 Textiles, printing and other skilled trades	SOC61 Caring personal service occupations
SOC81 Process, plant and machine operatives	SOC71 Sales occupations	SOC62 Leisure, travel and related personal service occupations
SOC82 Transport and mobile machine drivers and operatives	SOC72 Customer service occupations	
SOC91 Elementary trades and related occupations	SOC92 Elementary administration and Service occupations	

Table A.2: Qualifications in the UK: General vs Vocational qualifications

Level	Common qualifications
Level 1	Foundation Diploma, GCSE (grades D–G), Scottish National level below and equal to level 4
	NVQ Level 1, City and Guilds foundation-part 1, GNVQ foundation level, BTEC first certification, RSA level 1, Entry level qualification, Level 1 Award, Basic Skill qualification, Key Skill qualification, YT/YTP Certificate
Level 2	Higher diploma, O-level - GCSE (grades A*–C), Scottish National level 5, intermediate Welsh Baccalaureate
	NVQ Level 2, City and Guilds Craft- part 2, GNVQ intermediate, BTEC level 2, RSA Level 2, Level 2 Diploma/Certificate
Level 3	Advanced diploma, A-level, International Baccalaureate, SCE higher, Scottish Baccalaureate, Advanced Welsh Baccalaureate
	NVQ Level 3, City and Guilds Advanced Craft, GNVQ Advanced, BTEC National, RSA level 3, Level 3 Award/Certificate
Level 4	Certificate of Higher Education
	NVQ Level 4, Higher National Certificate (HNC), BTEC Professional award, certificate and diploma level 4, RSA Level 4, Level 4 Award/ Certificate/Diploma, Nursing
Level 5	Diploma of Higher Education, Foundation degree, Teaching foundation stage/ primary education/secondary education/further education.
	Higher National Diploma (HND), BTEC Professional Award, Level 5 Certificate/Diploma/ Award
Level 6	First Degree/ Foundation degree
	BTEC Advanced Professional Award, Level 6 Certificate/Diploma/Award
Level 7	Master's degree, Integrated master's degree
	BTEC Advanced Professional award, Postgraduate certificate/ diploma level 7
Level 8	NVQ Level 5
	Doctorates

Appendix

Figure A.1: Relative density balanced versus unbalanced data by education and occupation types



Appendix: Composition of background characteristics

$$R_{ijsq} = \beta_0 + \beta_1 Background_{ijsq} + \beta_2 Family_{ijsq} + \beta_3 Job_{ijsq} + \epsilon_{ijsq}$$

- The human capital measures (qualification type and level) are found to be significant and to have the expected relationship with the relative wage: higher-educated women, on average, perform better in relative wage terms.
- Age also influences relative wages, particularly for women in male-dominated roles, with relative pay rising as women grow older, especially for those with a general qualification.
- Having children impacts relative pay for women in female-dominated or mixed occupations, leading to a decrease in relative wages, particularly pronounced for women with vocational backgrounds
- Being married is negatively associated with relative wages in female-dominated occupations.

Appendix: Subject of the highest qualification achieved

$$R_{ijsq} = \beta_0 + \beta_1 Background_{ijsq} + \beta_2 Family_{ijsq} + \beta_3 Job_{ijsq} + \alpha_0 Vocational_{ijsq} * MatchedSubject_{ijsq} + \alpha_1 Vocational_{ijsq} + \alpha 2 MatchedSubject_{ijsq} + \epsilon_{ijsq}$$

- Women with vocational backgrounds, would benefit from obtaining qualifications focused on medicine or management, respectively.
- Acquiring a relevant qualification could assist women working in SOC61 "Caring personal and service occupation," SOC22 "Health professionals," SOC24 "Business, media, and public service professionals," and SOC35 "Business and public service associate professionals" to achieve improved standings within the male wage distribution.
- Women with a vocational background are worse off than those with a general background in terms of relative wage.

Appendix: Weekly working hours

The distribution of weekly working hours across wage deciles for women and men within different occupation types, reveals that women in female-dominated fields consistently have the lowest average working hours, with the most significant gender gap in terms of monthly working hours occurring in the top percentile.