

Multilevel modelling for gender wage gap analysis

Violeta Calian, Kristín Arnórsdóttir

Statistics Iceland

Conclusions

- Gain: modelling and understanding wages and wage differences (distributions or mean & higher moments)
- *Findings:*
 - Decreasing gap(s), through time
 - Some characteristics have *same* influence on wages of men and women:
 - Icelandic background
 - Balanced mixture of men/women in an occupation
 - Proportion of employees older than 35
 - Some characteristics have better effect on *women's* wages (e.g. education)
 - Some characteristics have better effect on *men's* wages (the gap still grows with age and employment length)

Results

- New models: multilevel/hierarchical (MLM)
 - type (fixed time, time dependent)
 - set of characteristics: demographic, education, (individual/group -) work related
- Comparisons
 - additive <-> *adjusted gap*
 - interactive <-> *explaining* the gap based on differences in:
the effects of/and model characteristics
 - restricted, optimum, maximal (sets of characteristics)

Models: $P(Y|a) = F1(X)$ where $P(a|b) = F2(c, Z)$ where...

- Type: Multilevel/Hierarchical, Bayesian + frequentist complement

- Why:

„all (components/prior information/characteristics) in one“ & uncertainty report

- R-Tools:

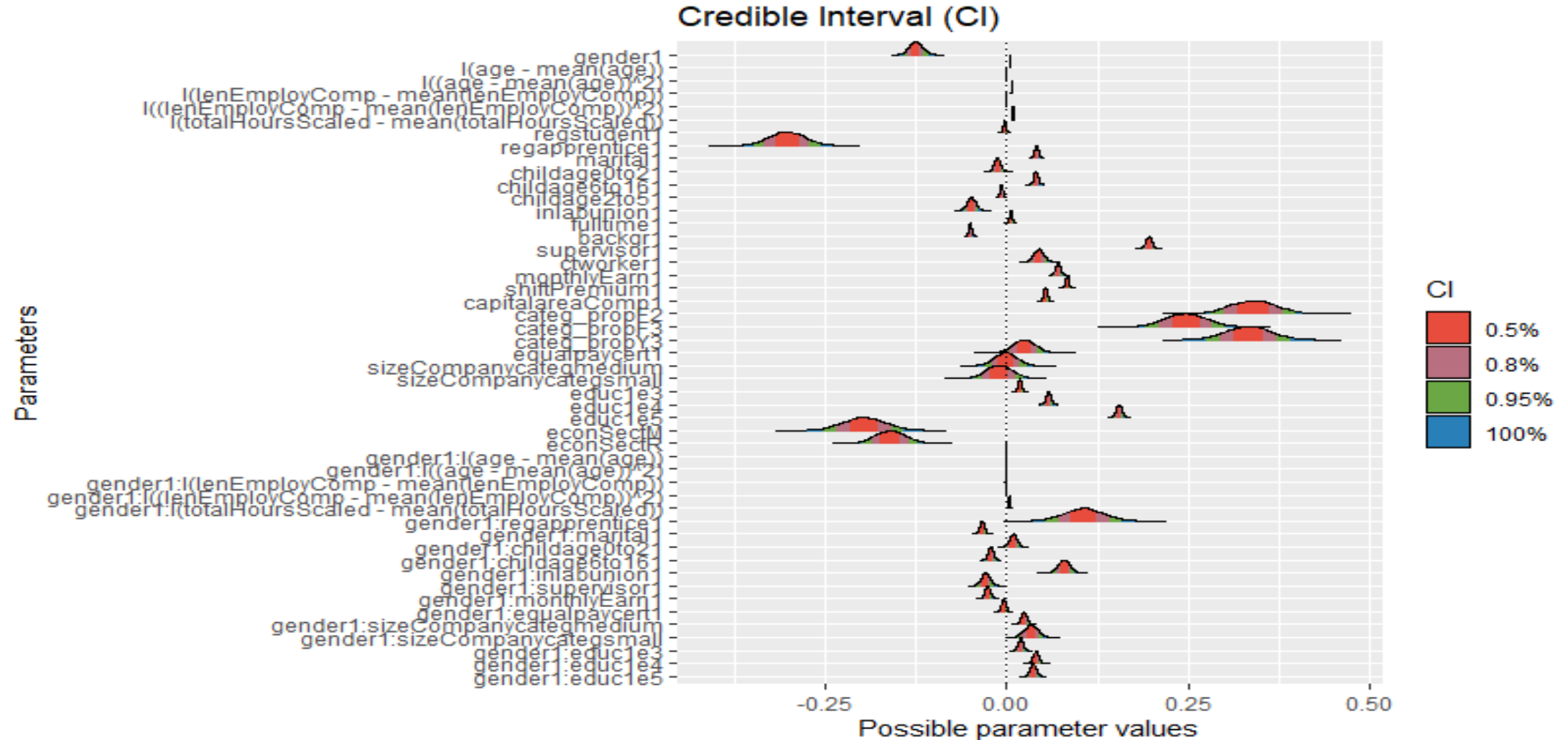
several Stan-running R packages like *brms*, *arm*, *bayestestR*, ...

and the faster *lme4*-for frequentist / initializations, ...

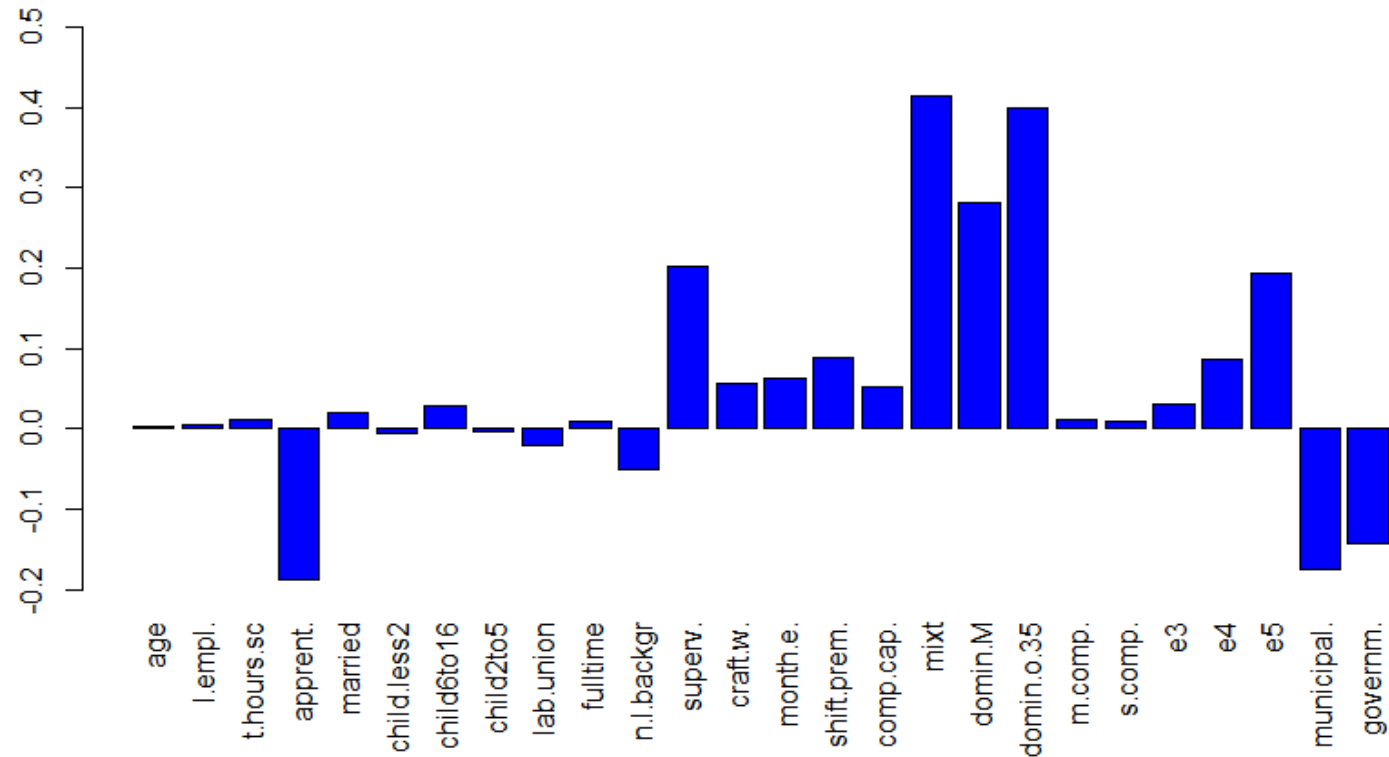
Tested research hypotheses

- *which characteristics* have a statistically significant influence on the hourly wages and did this influence change over the period 2008-2020?
- do these *influences depend on gender* and if so, do they evolve with time?
- what is the *estimated wage gap* and how did it change during the past decade, when accounting for the differences between the characteristics of male and female employees?

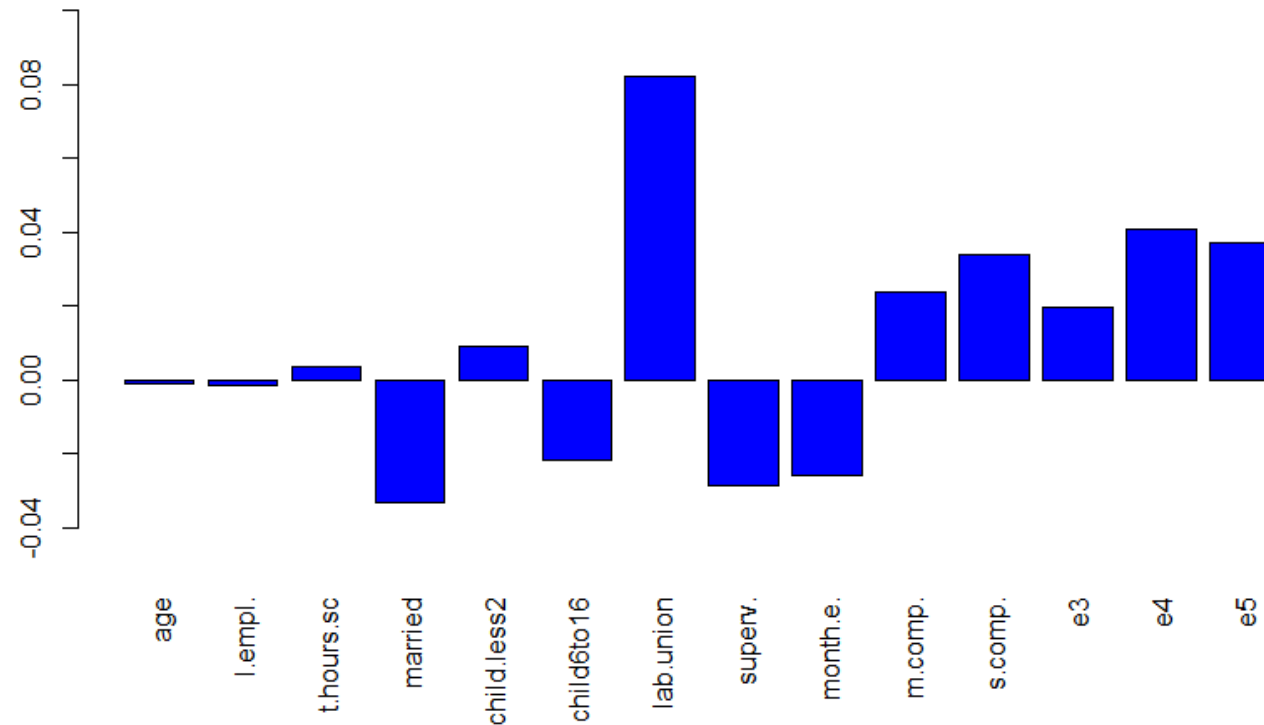
Testing: significance of effects and their dependence on gender



*What matters for regular, hourly wages
after accounting for correlations within companies or due to common occupation and
economic activity
(see: units and reference values of covariates)*



*„What matters for wages“ depends on gender:
after accounting for correlations within companies or due to common
occupation and economic activity
(Is the effect of covariates the same for men and women? Sometimes, yes!)*



Thank you!

- <https://github.com/violetacln/GIW>
- code and paper & references therein!