

TRAILS Project

TRAILS is a Horizon Europe funded research project



“Enabling Data Analytics for Actions Tackling Skills Shortages & Mismatch”

Participating partners

- ESRI
- AUTH and DUTH (Greece)
- EARLALL and IPSOS (Belgium)
- University of Naples (Italy)
- Tilburg University and SkillLab (Netherlands)

Educational Mismatch in Europe: Incidence, Determinants and the Impact of Increased Remote Working

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What is educational mismatch?

- When an employee's educational attainment does not match the level required to do their job
- If an employee's education level is below the level required to do their job, they are *undereducated*
- If an employee's education level is above the level required to do their job, they are *overeducated*

Why is mismatch important?

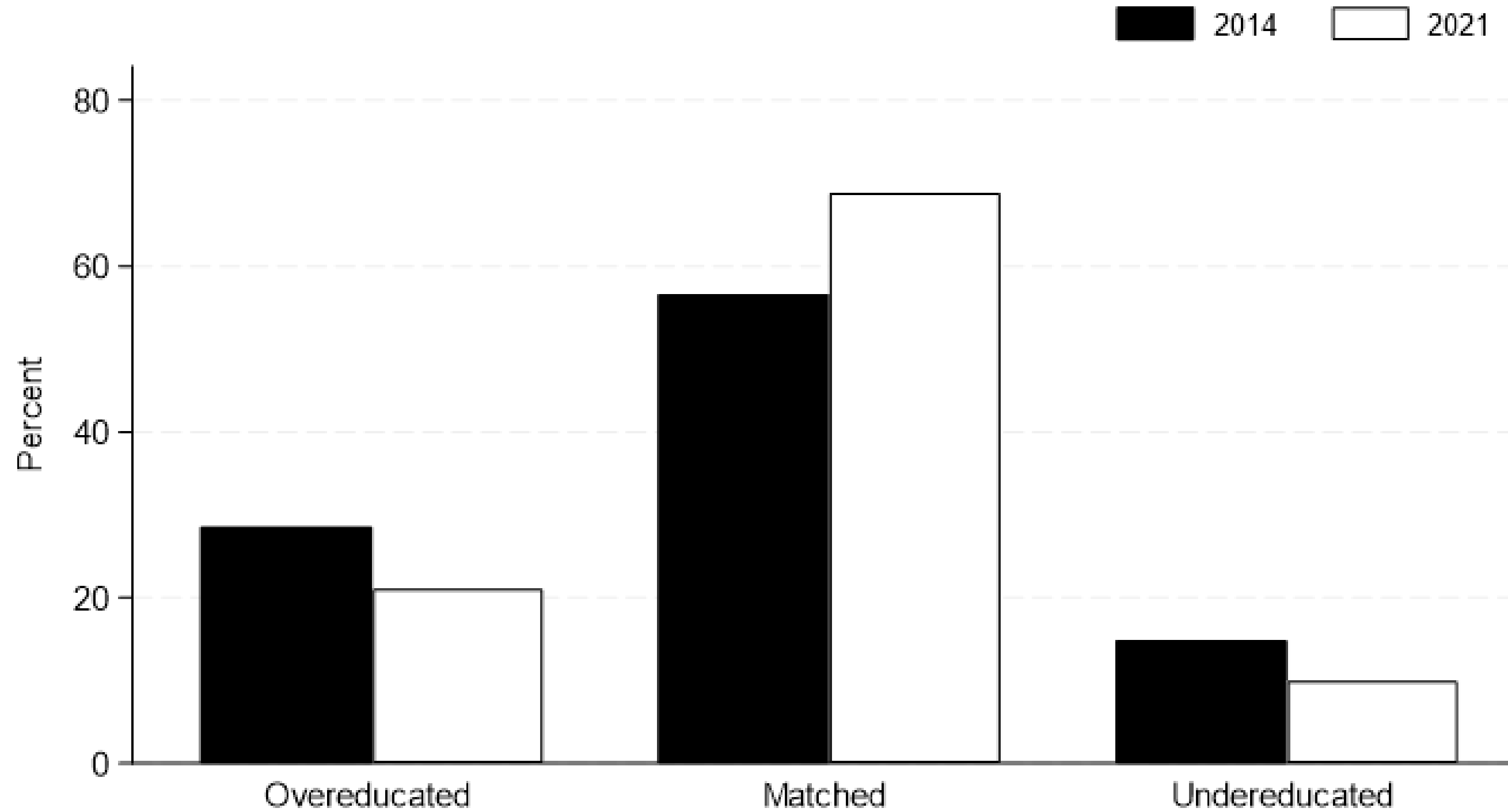
- Educational mismatch has important consequences for both employees and employers
- Overeducated employees may have lower wages, lower job satisfaction and greater likelihood of leaving their job (Sánchez-Sánchez and McGuinness, 2015; Bender and Heywood, 2009)
- An undereducated workforce negatively impacts a firm's productivity and profits (Kampelmann and Rycx, 2012; Mahy et al., 2015; Kampelmann et al., 2020)

What we do in this paper...

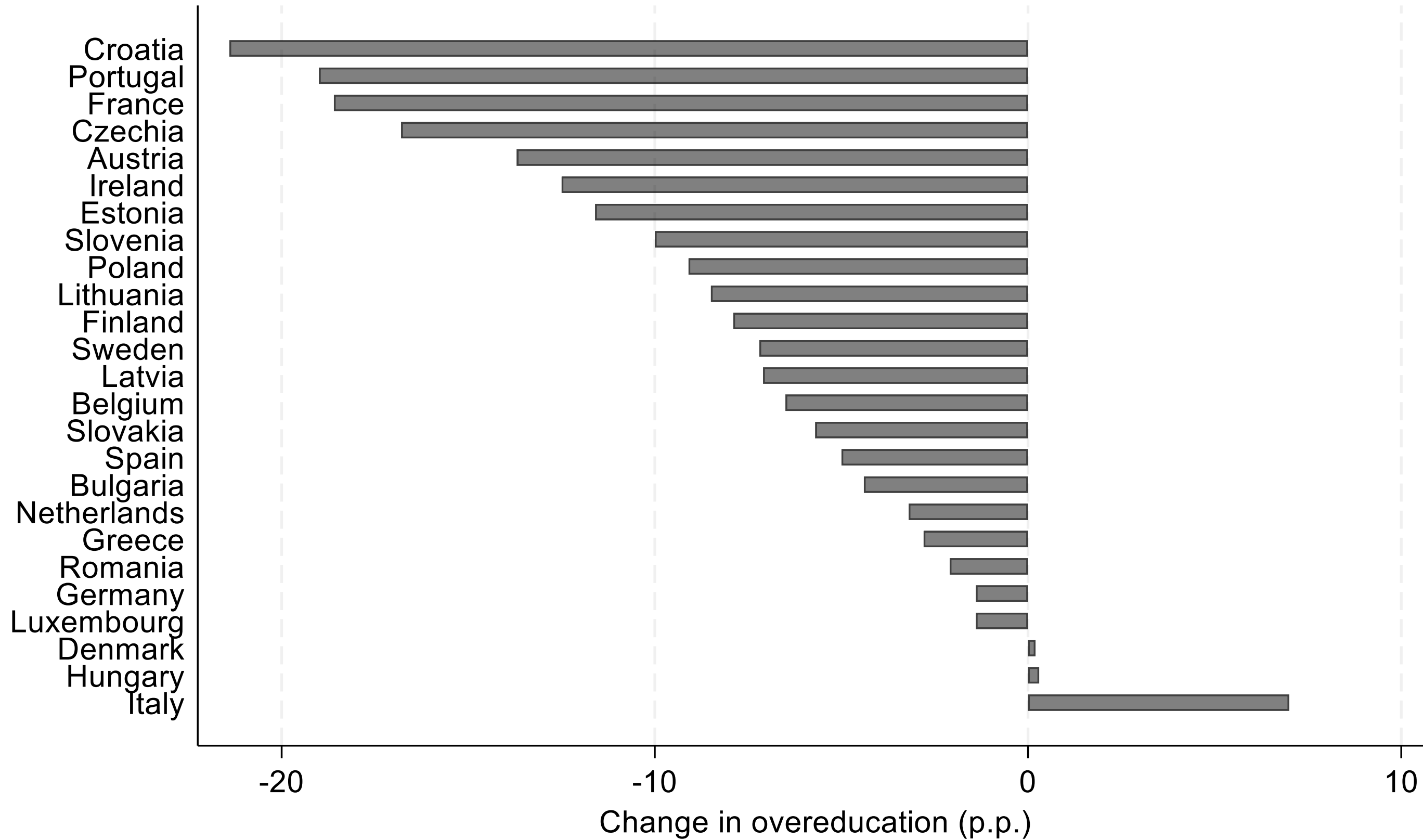
- Compare the incidence of mismatch in 2014 to 2021
- Use a machine learning algorithm to identify the important determinants of mismatch
- Employ a decomposition technique to see if we can explain changes in mismatch over time
- Utilise a novel question in the European Skills and Jobs Survey to examine the impact of increased remote working on mismatch using a matching estimator

- Two waves of the European Skills and Jobs Survey (ESJS) – 2014 & 2021
 - EU-wide survey collecting information on skill requirements, skills mismatches education among adult workers in the EU
 - Administered by Cedefop
- Educational mismatch based on the following questions
 1. What is the highest level of education you have completed?
 2. What level of education is required to do your job?
- If $1 > 2$, the employee is overeducated
- If $1 < 2$, the employee is undereducated
- If $1 = 2$, the employee is matched

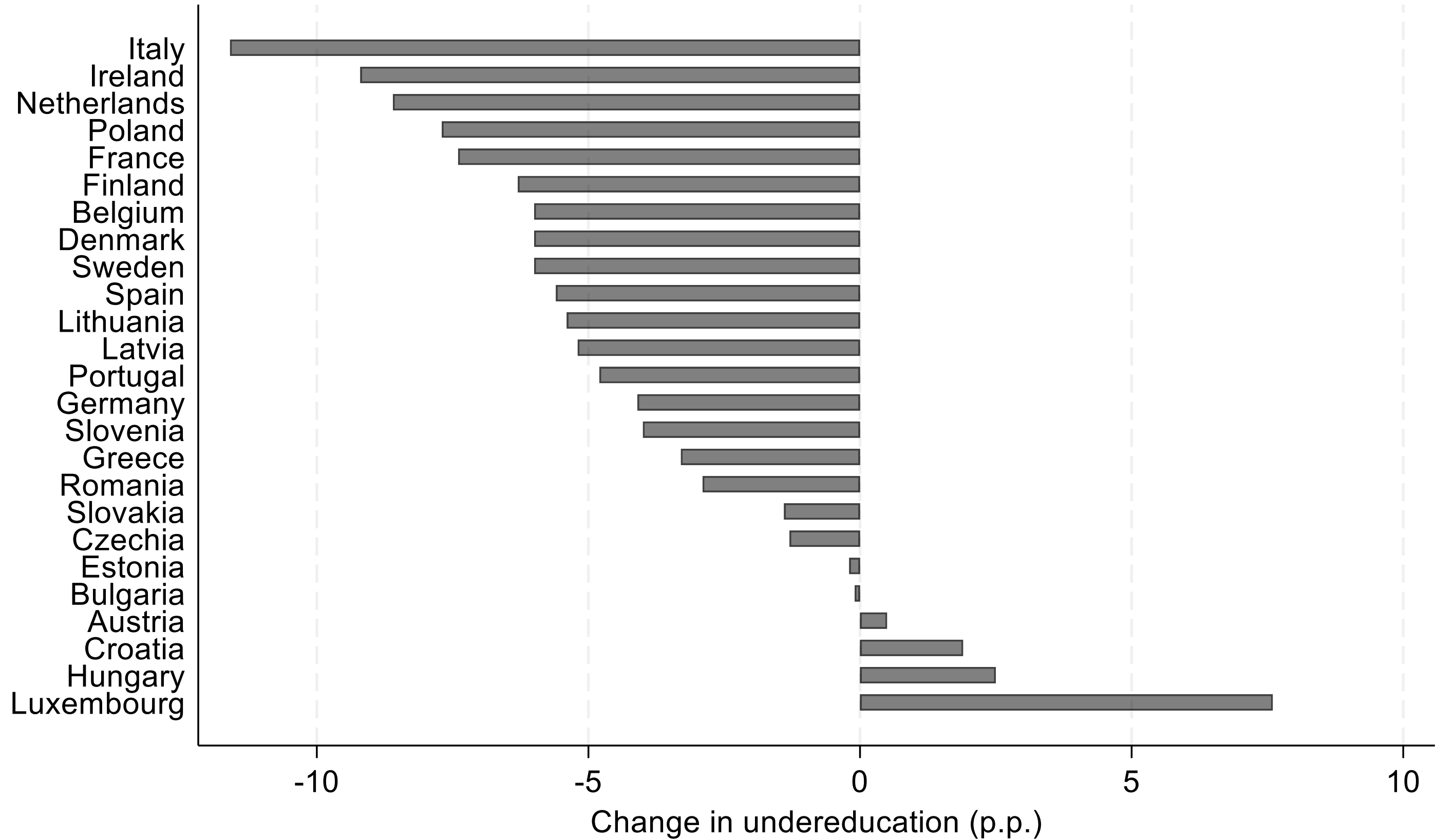
Incidence of Mismatch



Changes in overeducation



Changes in undereducation

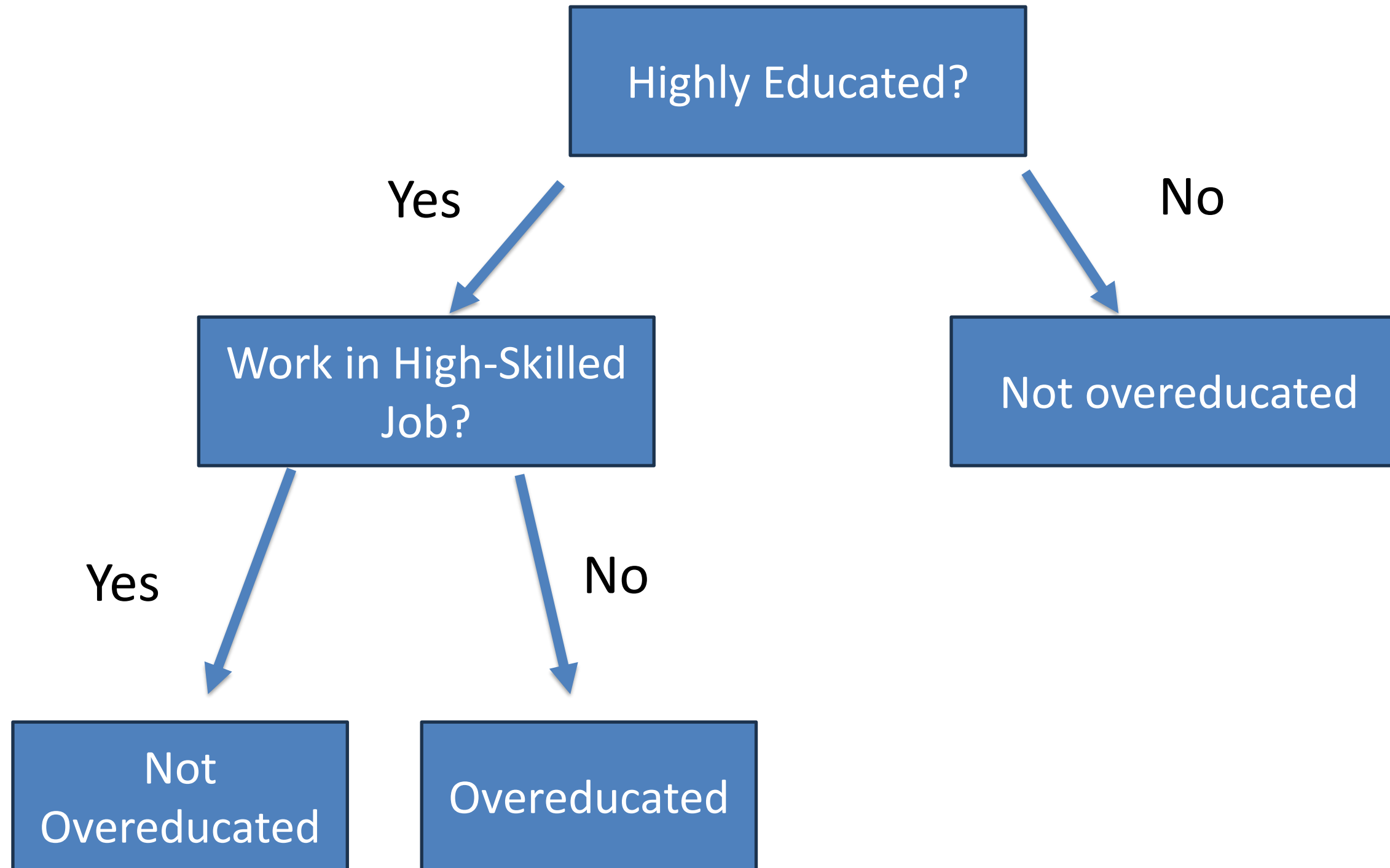


- What features are important in predicting whether somebody is mismatched?
- To investigate important predictors of mismatch, we use 2 approaches
 1. Machine learning algorithm – *random forest*
 2. Probit Model
- Our explanatory variables
 - Education; occupation; country; survey wave; job tenure; contract (temp / permanent); company size; full-time / part-time; gender; education type (vocational / academic); field of study

Random Forest

- Based on *decision trees*
 - Learn a hierarchy of if/else questions that lead to a decision
 - Non-parametric and more flexible than, e.g., linear regression or probit models
 - Used widely – e.g., medicine (predicting disease); finance (credit risk assessment)

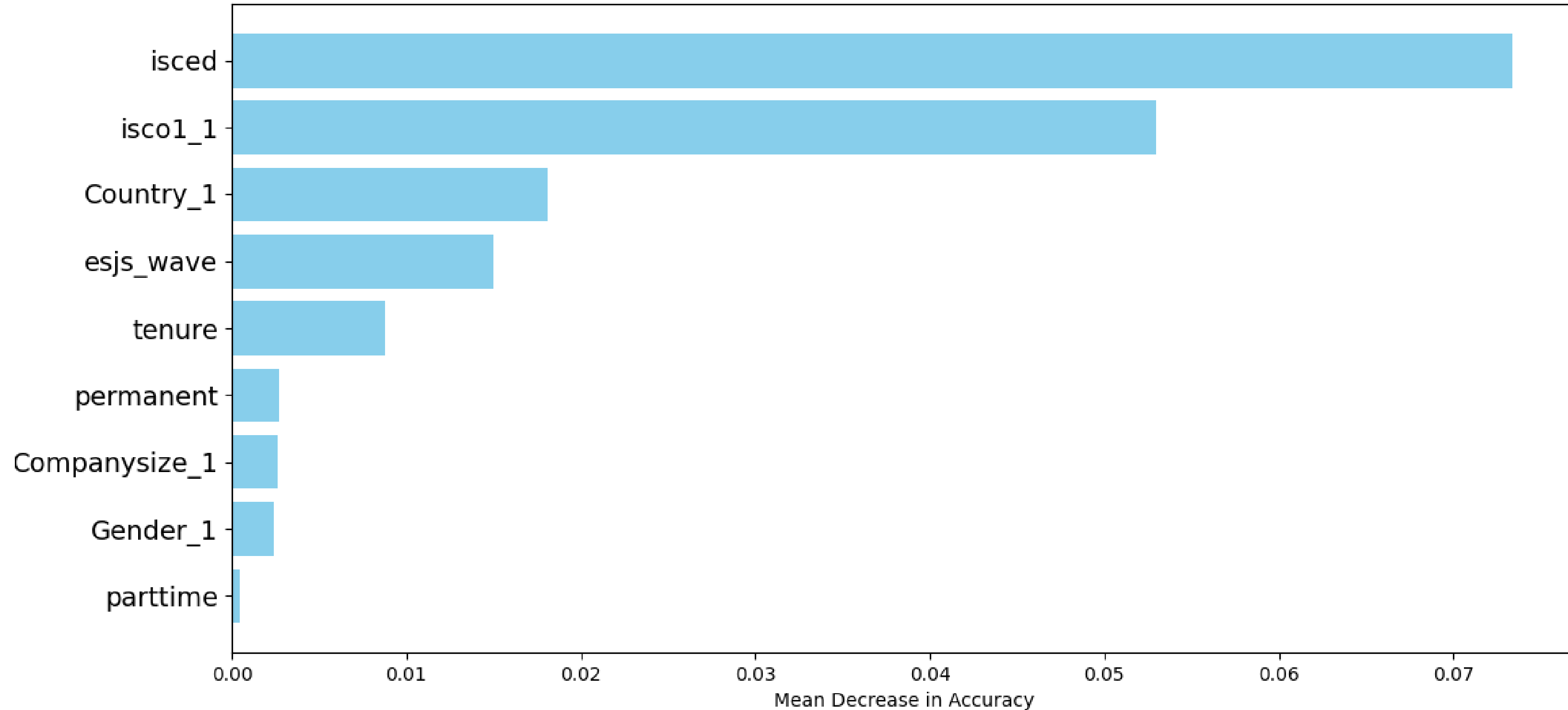
Decision Tree



Random Forest

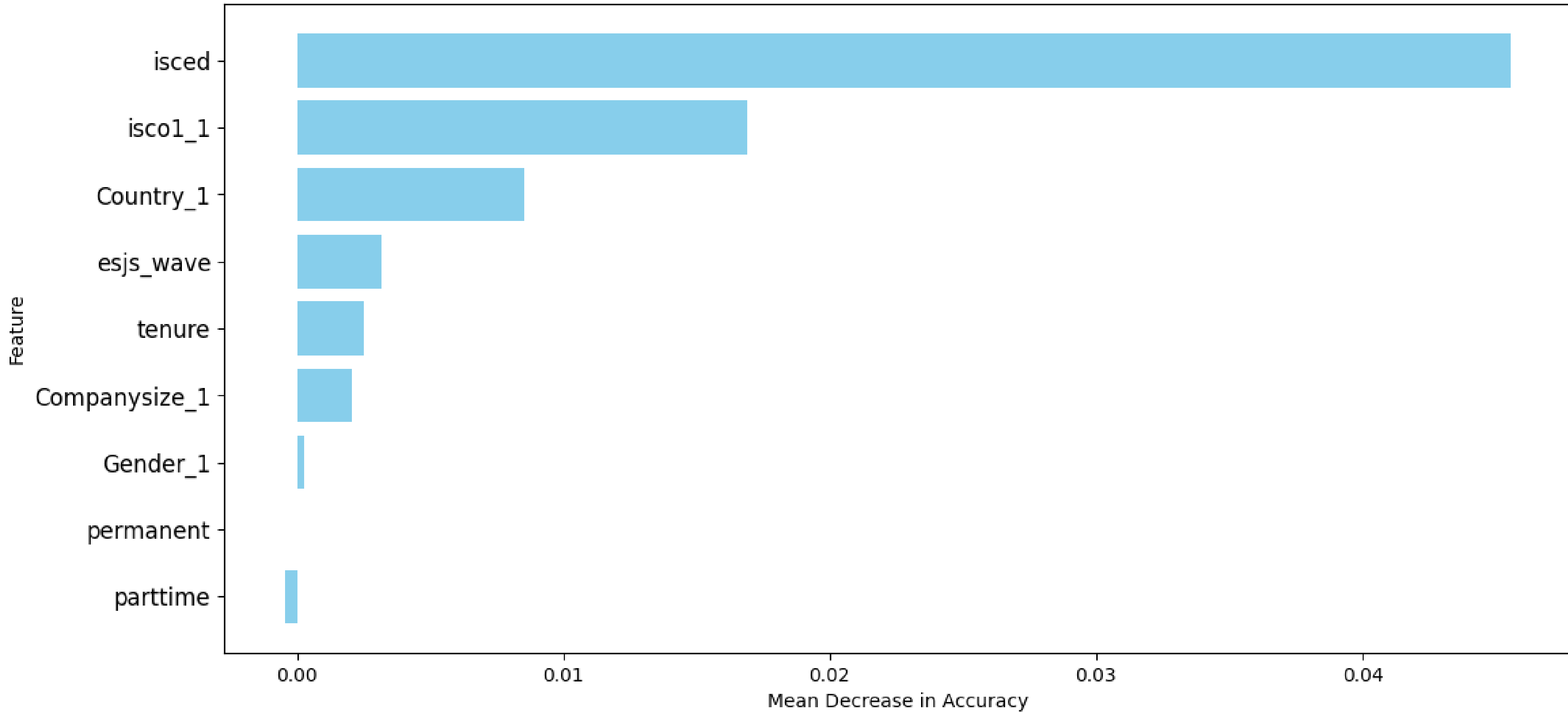
- A single decision tree may be prone to overfitting, producing poor out of sample predictions
- Random forest based on many bootstrapped decision trees and averages the predictions
- Performance is evaluated based on a training data set
- To evaluate feature performance, we use mean decrease in accuracy
 - Scramble a variable in the training data set and see how this affects the accuracy of the model

Feature Importance (Mean Decrease in Accuracy)



MDA - Undereducation

Feature Importance (Mean Decrease in Accuracy)



- How much of the decline in educational mismatch is
 1. Explained by changes in the characteristics of employees over time
 2. Unexplained

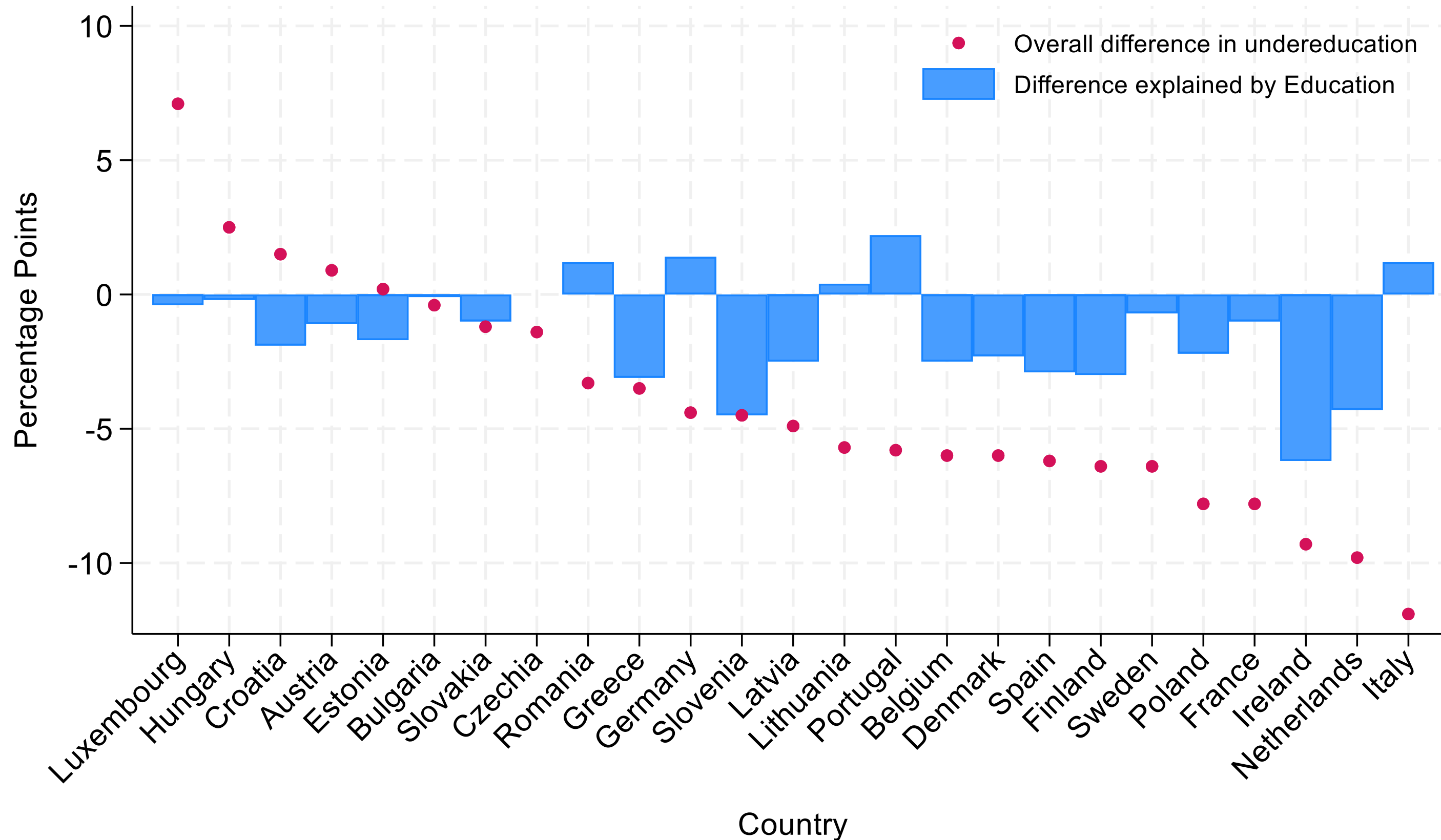
Undereducation

- Approximately one-third of the decline is explained by increased educational attainment

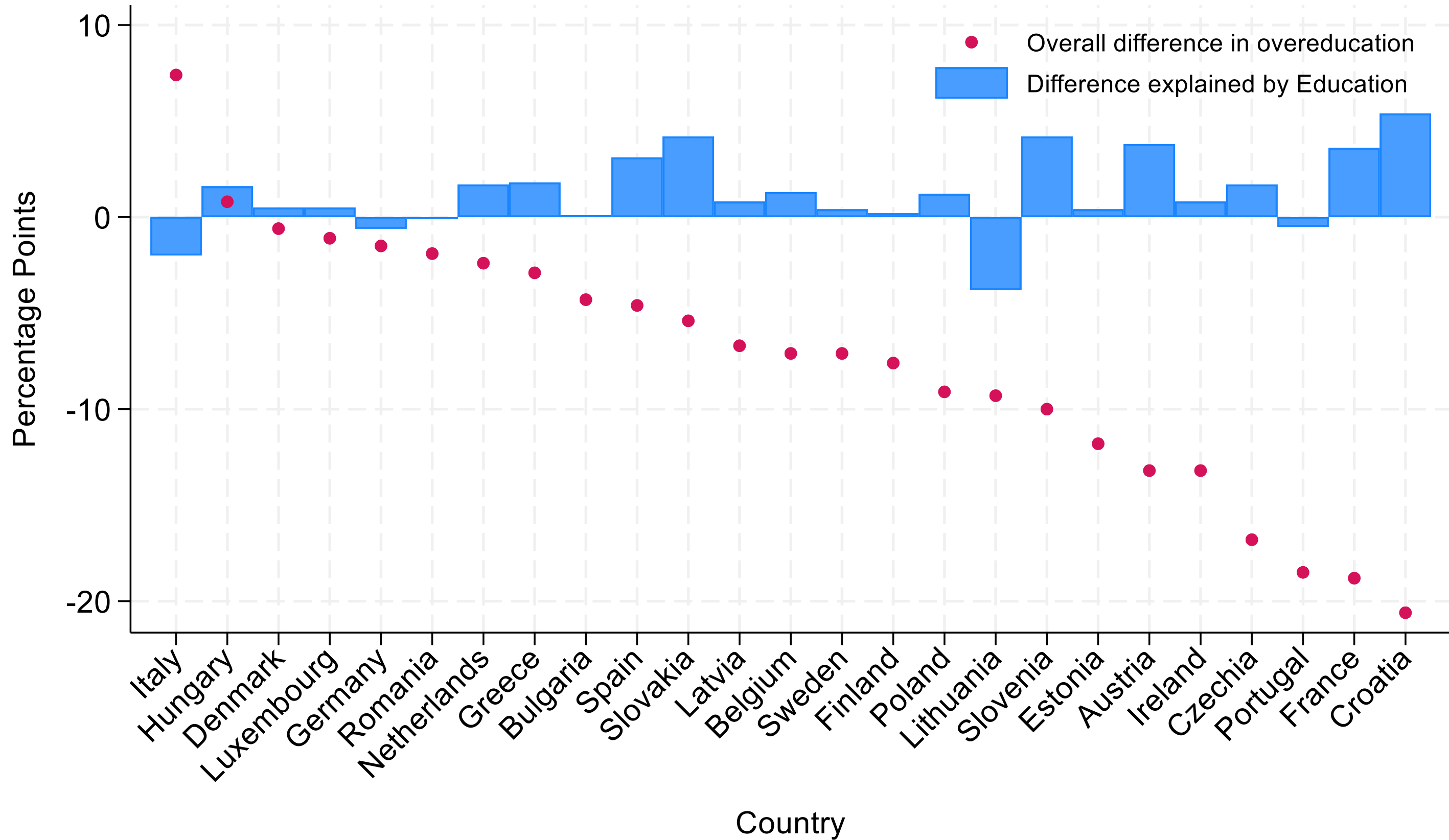
Overeducation

- Totally unexplained – in fact, there is a large negative explained component

Undereducation Decomp



Overeducation Decomp

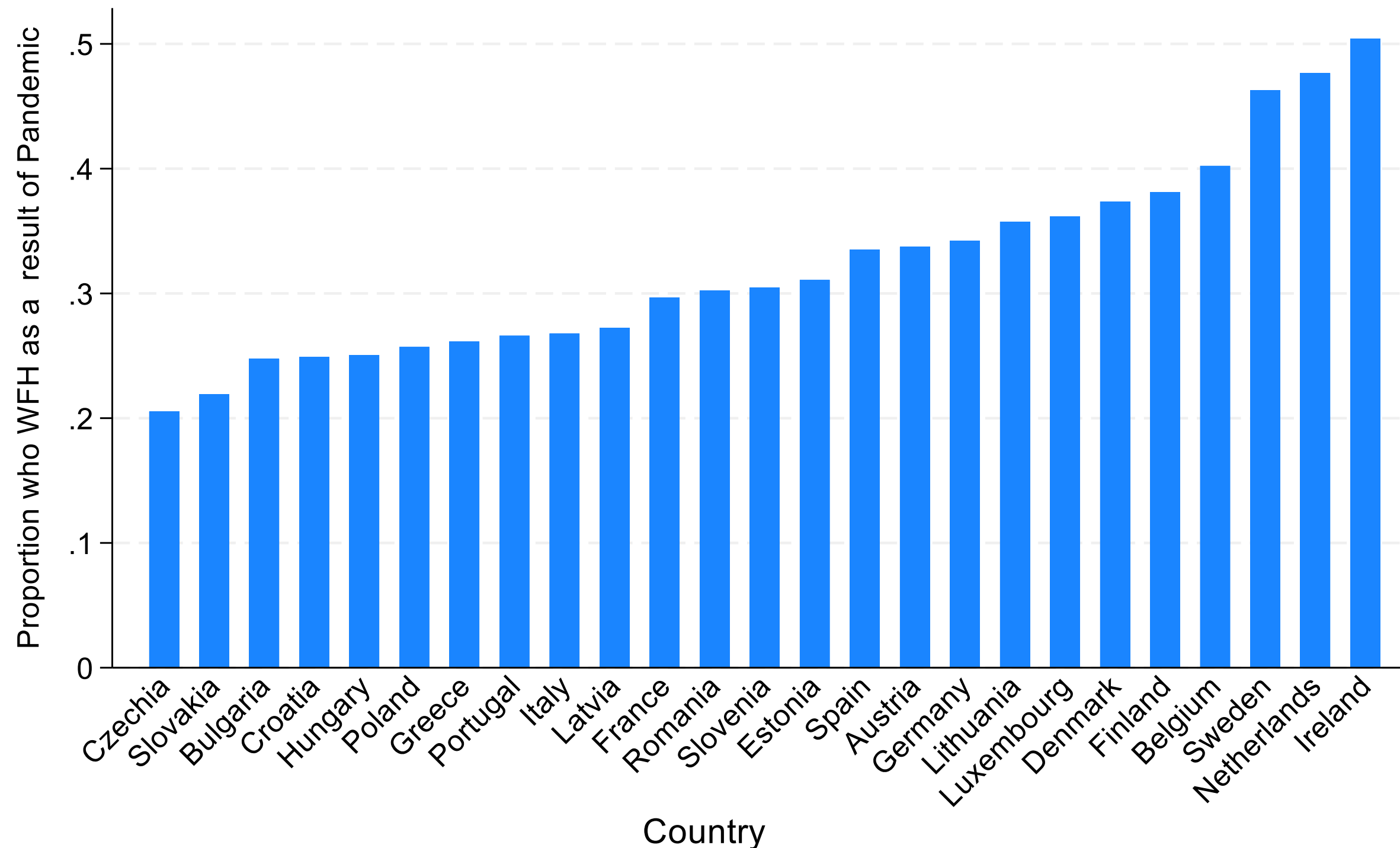


Other Explanations?

- The second wave was carried out in 2021
 - One significant change to labour markets was the increase in remote working
- Greater flexibility due to remote working may allow workers to find better matched jobs (Office for National Statistics, 2021)
 - However, lack of direct evidence on this
- Closest work is Santiago-Vela and Mergener (2022)
 - Using German data from 2018 - the option to work from home reduces overeducation risk

Remote Working

- In the second wave of data, employees are asked if they work from home more frequently compared to their situation before the pandemic



- Estimate the impact of increased remote working on educational mismatch
 - Probit model
 - PSM

Table 7: WFH as a determinant of Educational Mismatch

<i>Dep variable:</i>	Overeducation		Undereducation	
	(1)	(2)	(3)	(4)
<i>VARIABLES</i>				
WFH	-0.083 ^{***} (0.006)	-0.102 ^{***} (0.013)	0.025 ^{***} (0.003)	0.020 ^{***} (0.006)
Limited to Tenure < 2	NO	YES	NO	YES
Includes control variables	YES	YES	YES	YES
Country FE	YES	YES	YES	YES
Observations	28,536	6,607	28,536	6,607

Source: European Skills and Jobs Survey. Pooled probit specifications for overeducation {(1) and (2)} and undereducation {(3) and (4)}, including WFH dummy previously described. Coefficients reported are marginal effects. Country clustered standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

- Estimate the impact of increased remote working on educational mismatch
 - Probit model
 - PSM

Table 8: ATET (Propensity Score Matching Estimates) for WFH variable

	(1)	(2)
<i>DEPENDENT VARIABLE</i>		
Overeducation	-0.08 ^{***}	-0.10 ^{***}
Undereducation	0.03 ^{***}	0.02
Limited to Tenure < 2	NO	YES

Source: European Skills and Jobs Survey. Coefficients from PSM estimator applied to specifications in Table 7.

*** p<0.01, ** p<0.05, * p<0.1.

Conclusion

- Educational mismatch has declined significantly over time in the EU
- Much of the decline in undereducation can be explained by greater educational attainment
- The decline in overeducation is despite an increase in educational attainment
- It is possible that increased remote working has removed some geographical barriers to allow some individuals find better matched jobs
- Our evidence indicates that increased remote working associated with a 10 p.p. reduction in overeducation

Education

- Tertiary education: 30 p.p. more likely to be overqualified

Occupation

- Managers, professionals, associate professionals: 25 p.p. less likely to be overqualified

Time Period

- In wave 2: 10 p.p. less likely to be overqualified

Tenure

- Extra 10 years of job tenure – 4 p.p. less likely to be overqualified

We estimate our model on graduates only

- **Vocational education** and **field of study** also matter

Education

- Tertiary education: 30 p.p. less likely to be undereducated

Occupation

- Managers, professionals, : 20 p.p. more likely to be undereducated

Time Period

- In wave 2: 3 p.p. less likely to be undereducated

Tenure

- Extra 10 years of job tenure – 2 p.p. more likely to be undereducated

We estimate our model on graduates only

- **Vocational education** and **field of study** not very important