



Cornell University

Analysis of propensity-score matched data

HHS Methods Meeting 2012

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Propensity scores and regression

1. Propensity scores are a principled approach to causal inference, regression adjustment is not

Method	Explanation
1. Statistical adjustment:	Measure and control for all causes of y (impractical and not recommended)
2. Propensity score analysis:	Compare individuals who were selected to treatment to statistically similar controls using a matching algorithm

Propensity scores and regression

1. Propensity scores are a principled approach to causal inference, regression adjustment is not

Both rely on same assumption of no unmeasured confounders

$$(Y_0, Y_1) \perp T | X \quad \text{Ignorability}$$

Propensity scores and regression

2. Propensity scores are outcome-free and are not victim to (unintentional) biases

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In ideal study in which outcomes and covariates are clearly separated avoidance of bias is possible

Propensity scores and regression

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Regression models do not have to be modeled linearly.

Linearity violations can to some degree be assessed.

Progress with data mining techniques.

Propensity scores and regression

4. Regression extrapolates, whereas propensity scores put focus on common support

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Common support in multivariate space can be assessed without propensity scores (convex hull).

Propensity scores and regression

Regression adjustment

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Propensity score matching

Effects of military training

- Big Five personality traits are conducive to change
- Important life events can impact personality development
- **Jackson, J., Thoemmes, F., Jonkmann, K., Lüdtke, O., & Trautwein, U. (2012).**
Military training and personality trait development: Does the military make the man or does the man make the military? *Psychological Science*.



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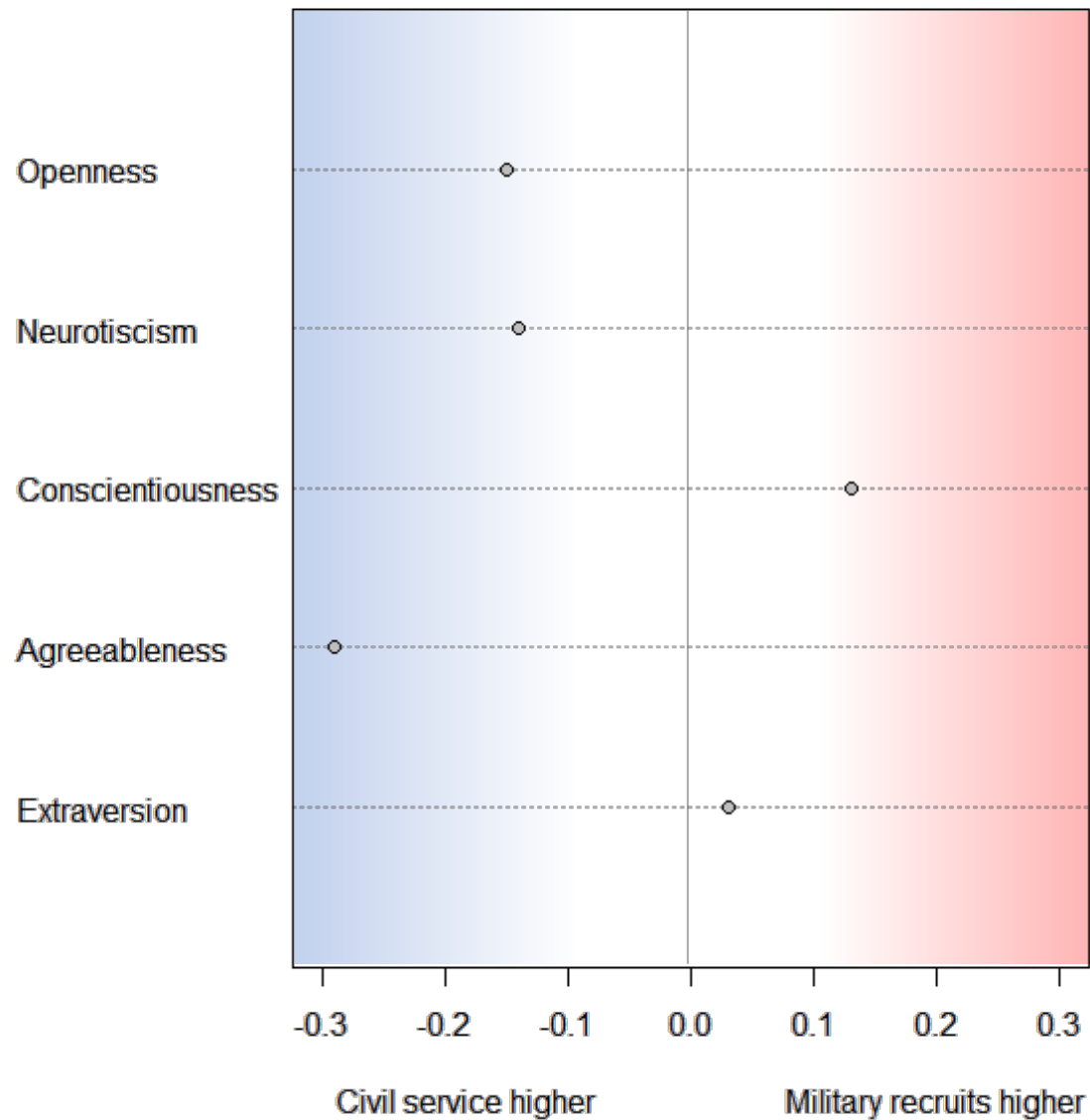
Effects of military training

- Until very recently, 18 year old men in Germany had to do either civil service or military training
- Any impact of military training on personality that is observed is likely confounded by selection effects

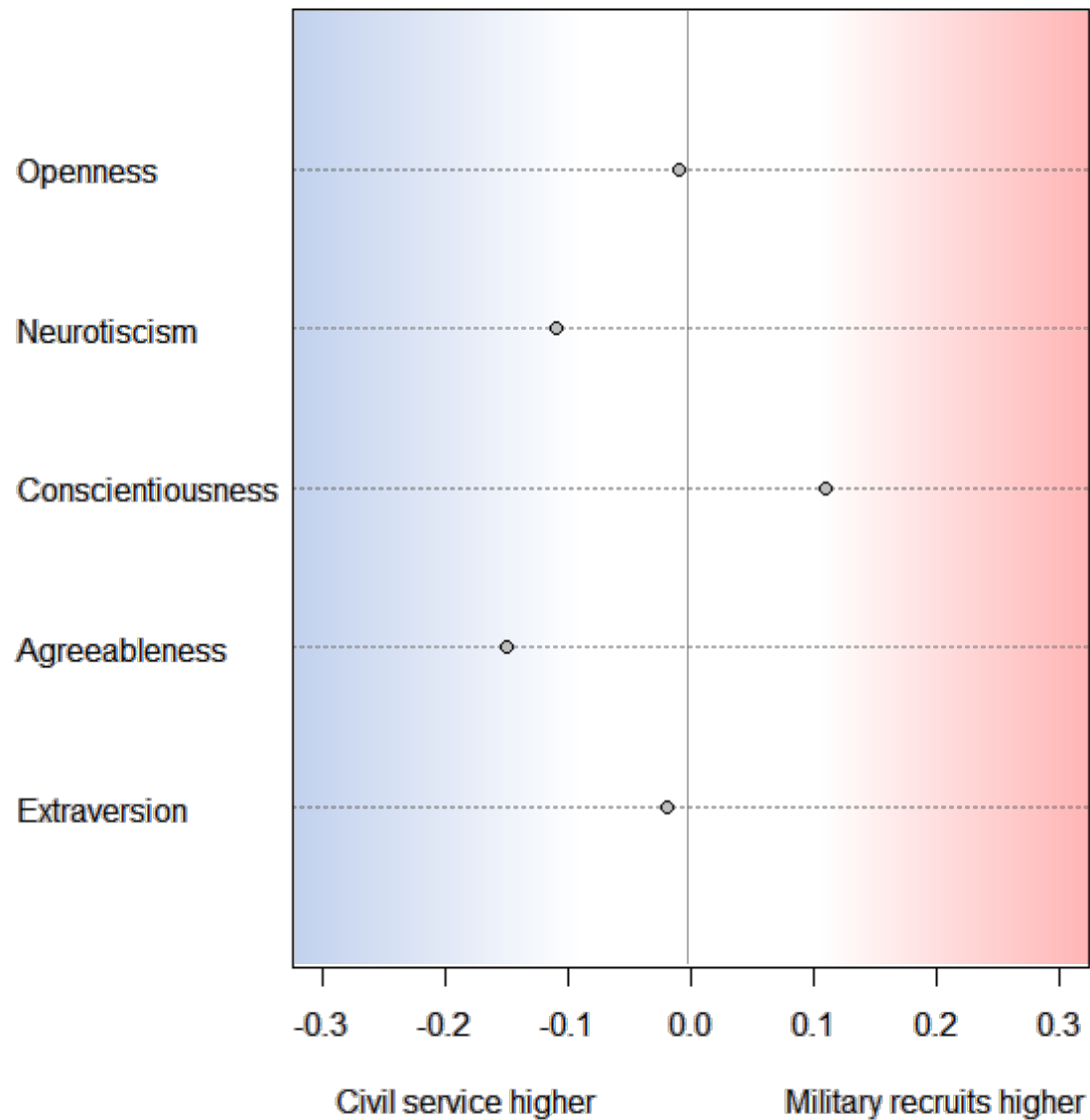
Effects of military training

- Large sample (~2,000) of college-bound youth were equated using PS matching on 38 covariates
- Pre-tests
- Socio-economic status & cultural capital
- Academic achievement
- Vocational interests
- ...

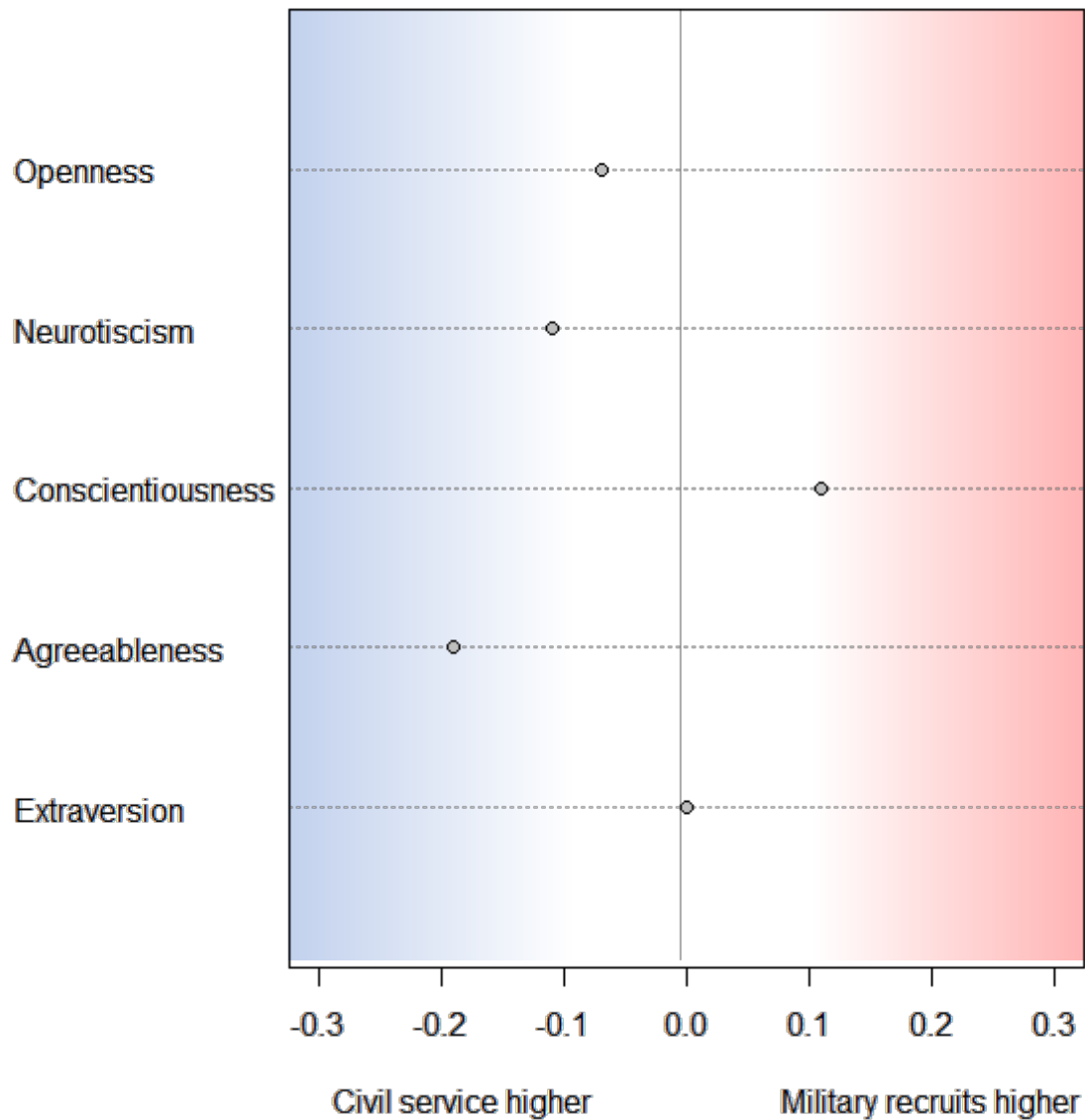
Selection effects (Differences t1)



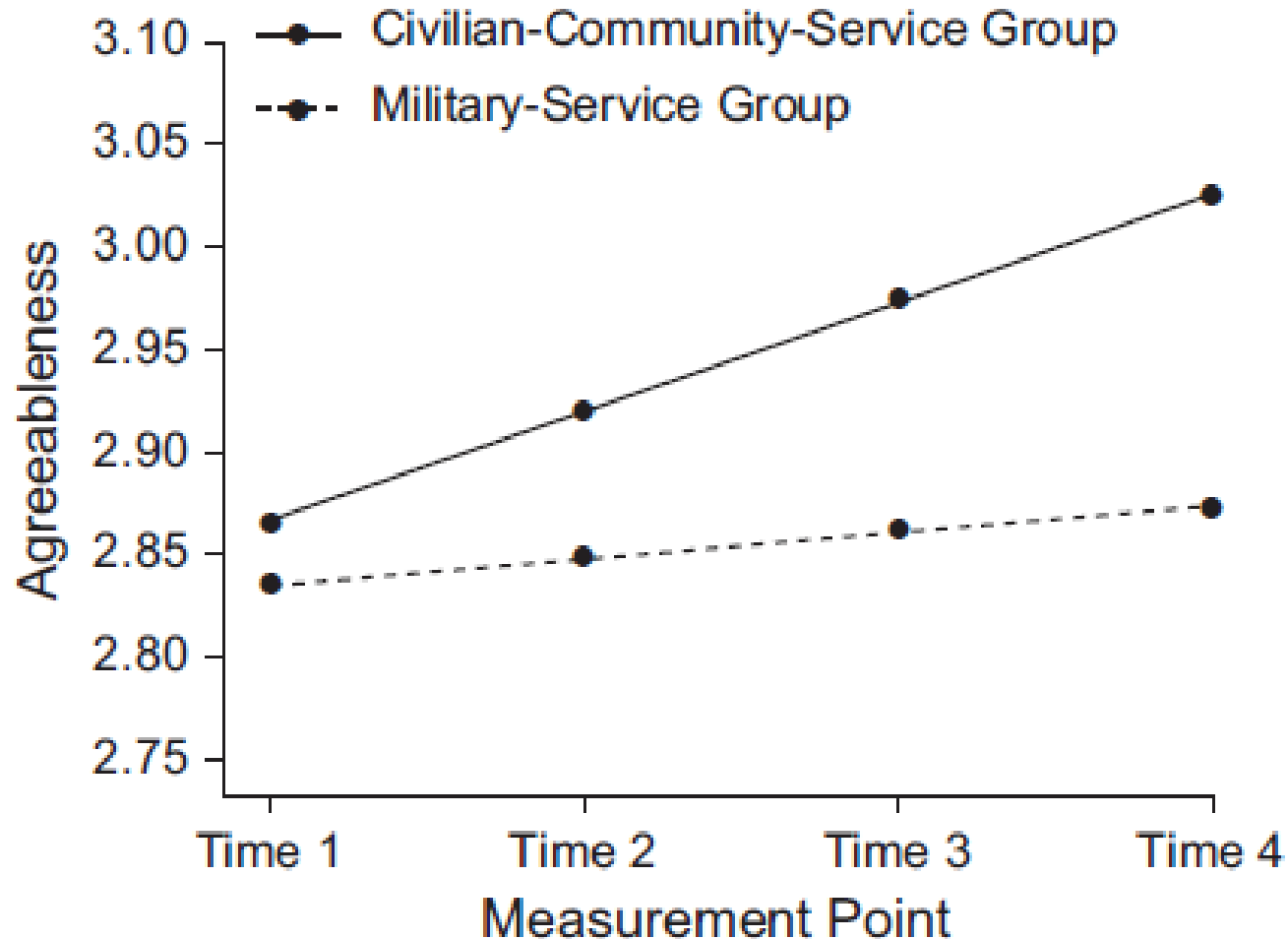
Effects after matching (Differences t2)



Effects after adjustment (Differences t2)



Longitudinal effects of military training



Latent growth model after propensity score matching

Summary

- Effects of military training on agreeableness are present after 1 year and even after 4 years, as assessed in latent growth model
- Potential unobserved confounders ?

Summary

- In this particular example
regression adjustment
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propensity score matching



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