

Causal Analysis on the NSW Job Training Program

By: Xiaoya Wang, Shu Cong

This study investigates the causal effect of the National Supported Work (NSW) Demonstration job-training program on participants' 1978 earnings using causal inference methods, particularly propensity score matching. The analysis leverages the *nsw_mixture* dataset, consisting of 445 observations and 11 variables, including treatment and earnings.

We assume the response model is:

$$Y = \alpha_0 + \alpha_1 T + \sum_{i=1}^p \alpha_i Z_i + \epsilon,$$

where Y represents earnings, T is the treatment indicator, and Z are the p -dimensional confounders with $\epsilon \sim N(0, \sigma^2)$. Then, we estimate the probability of receiving treatment using a propensity score model based on logistic regression:

$$\log\left(\frac{\pi}{1-\pi}\right) = \beta_0 + \sum_{i=1}^p \beta_i Z_i.$$

To obtain causal estimates, we apply a full propensity score matching approach. Covariate balance between treated and control groups is assessed using standardized mean differences (SMD), with SMD values below 0.1 indicating balance. Figure 1 displays the covariate balance before and after matching.

Our analysis estimates the average treatment effect (ATE) on 1978 earnings to be \$1,977, with a standard error of 704 and a p-value of 0.00501, demonstrating a statistically significant positive effect of the NSW program. Results are shown in Table 1.

Term	Contrast	Estimate	Std. Err	z	$\Pr(> z)$	S	2.5%	97.5%
treat	$\mu_1 - \mu_0$	1977	704	2.81	0.00501	7.6	596	3357

Table 1: Estimated Average Treatment Effect on 1978 Earnings

In conclusion, our results indicate that the NSW job-training program

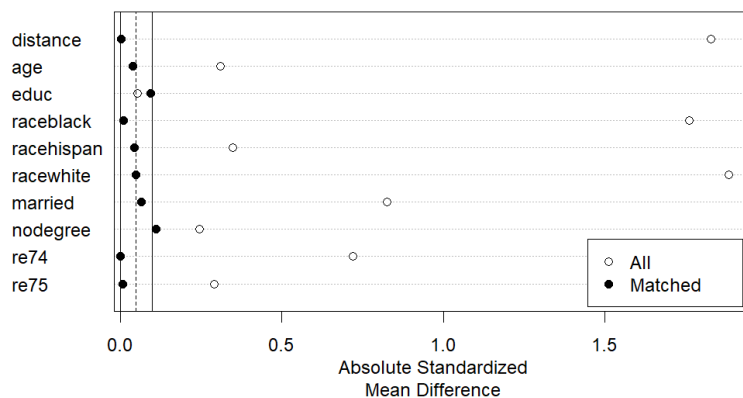


Figure 1: Standardized Mean Differences (SMD) Before and After Matching for Covariate Balance

had a significant positive impact on participants' earnings in 1978. In future work, we plan to explore more complex models and different approaches.

References

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