

PROPENSITY SCORE
MATCHING AND

DIFFERENCE IN DIFFERENCE

A HUMAN SERVICES
EXAMPLE

MAGGIE SCHULTZ PATEL AND SUNIYA FAROOQI
RESEARCH ASSOCIATE AND DATA ANALYST
SOCIAL IMPACT RESEARCH CENTER (FORMERLY)

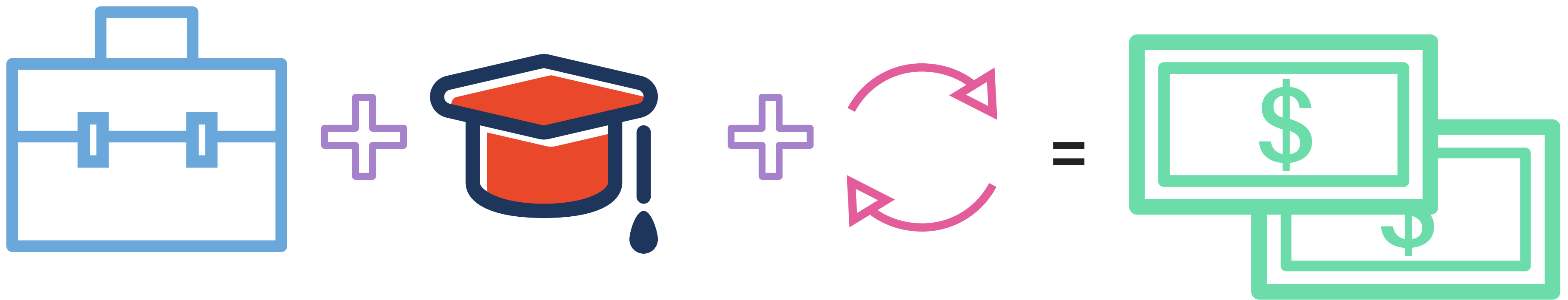


C O N T E X T

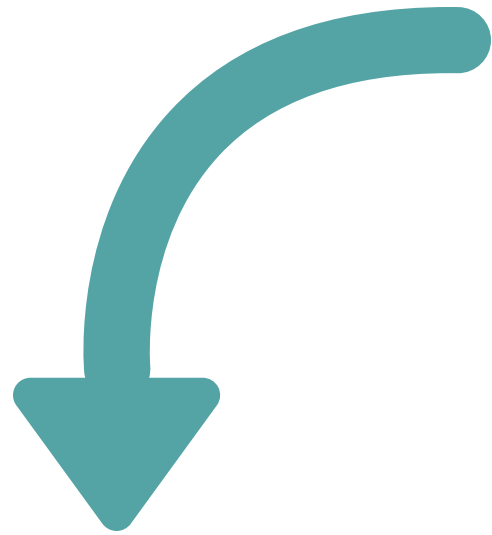
When including marginally attached workers, discouraged workers, and involuntary part-time workers, Michigan's post-recession 2010 un- or underemployment rate was at

21%

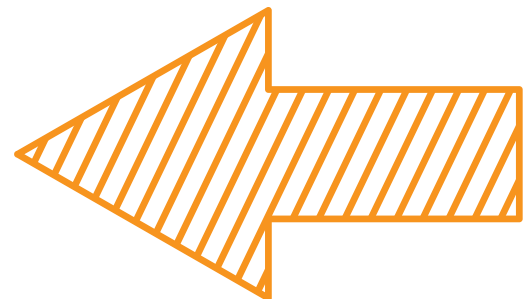
Potential Solution



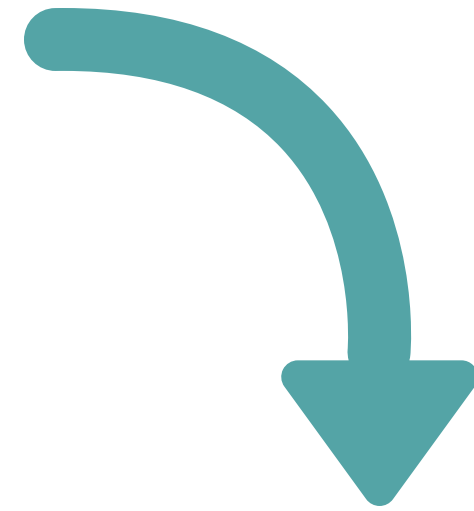
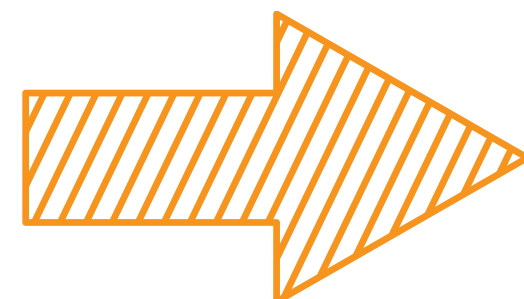
Workforce Center



Costly
Intervention



PSM



Business as
Usual

MATCHING VARIABLES

- Demographics (Race, Age, Sex)
- Pre-program income (4 quarters of wage data)
- Formerly Incarcerated
- Long-term Unemployed (defined as 6 months or more)
- Education Level
- Enrollment Quarter (since a multi-year project)

MEAN DIFFERENCES BEFORE MATCHING FIGURE 36

Variable	Treatment Group	Comparison Group	Difference	P-value
Age	33 (-0.486)	35 (-0.191)	-2 (-0.295)	.000*
Average Pre Year Income	\$1,802 (-155.40)	\$13,894 (-306.67)	-\$12,091 (151.27)	.000*
Male	66.3% (-0.021)	56.7% (-0.007)	9.7% (-0.014)	.000*
Formerly Incarcerated	19.3% (-0.017)	6.2% (-0.003)	13.1% (-0.014)	.000*
Race	2.8 (-0.075)	4.3 (-0.027)	-1.5 (-0.047)	.000*
Long Term Unemployed	64.6% (-0.021)	52.0% (-0.007)	12.6% (-0.014)	.000*
Education Level	12.6 (-0.068)	12.8 (-0.031)	-0.2 (-0.037)	.126
Enrollment Quarter	3.0 (-0.041)	2.0 (-0.015)	1.0 (-0.026)	.000*

*Starred entries indicate categories with statistically significant differences at the .05 level. Standard errors in parentheses.

MATCHING STRATEGIES

- Nearest neighbor (1:1)
- Nearest neighbor (1:5)
- Caliper
- Normal Kernel

ROBUSTNESS CHECKS

FIGURE 38

Outcome	Nearest Neighbor (1)	Nearest Neighbor (5)	Caliper (0.1)	Normal Kernel
Post Year 1 Earnings	-\$1,840 (755.3) .001*	-\$2,154 (509.5) .000*	-\$1,840 (755.3) .001*	-\$1,816 (481.9) .002*
Post Year 2 Earnings	-\$1,658 (880.2) .016*	-\$1,996 (652.0) .005*	-\$1,658 (880.2) .016*	-\$1,610 (615.6) .003*

*Starred entries indicate categories with statistically significant differences at the .05 level.
Standard errors in parantheses.

MEAN GROUP CHARACTERISTICS BEFORE AND AFTER MATCHING

FIGURE 35

Variable	Sample	Treatment Comparison		T-stat	P-value
		Group Mean	Group Mean		
Age	Unmatched	33	35	-3.45	.001*
	Matched	33	34	-1.54	.124
Average Pre Year Income	Unmatched	\$1,802	\$13,895	-11.96	.000*
	Matched	\$1,802	\$4,820	-5.14	.000*
Male	Unmatched	66.3%	56.7%	4.25	.000*
	Matched	66.3%	64.2%	0.71	.478
Formerly Incarcerated	Unmatched	19.3%	6.2%	11.0	.000*
	Matched	19.3%	15.9%	1.41	.160
Race	Unmatched	2.8	4.3	-15.75	.000*
	Matched	2.8	3.2	-3.42	.001*
Long Term Unemployed	Unmatched	64.6%	52.0%	5.47	.000*
	Matched	64.6%	59.4%	1.71	.087
Education Level	Unmatched	12.6	12.8	-1.53	.126
	Matched	12.6	12.8	-1.14	.253
Enrollment Quarter	Unmatched	3.0	2.0	19.62	.000*
	Matched	3.0	2.9	1.64	.101

*Starred entries indicate categories with statistically significant differences at the .05 level.

T H E F I X

Difference in Difference (DiD) Estimation

Simple DiD:

Avg income change
among
comparison group

–

Avg income
change among
treatment group

PSM

+

DiD

~~Observed differences~~

~~Unobserved differences~~

No
Confounders

=



POTENTIAL EXPLANATIONS

Ashenfelter Dip

Parallel Trend Assumption Violation

LESSONS LEARNED

Optimal matching
Time series
Longitudinal HLM
DiD Estimators

**A C C E S S T H E F U L L
R E P O R T :**

<https://www.issuelab.org/resource/michigan-earn-and-learn-an-impact-outcome-and-implementation-evaluation-of-a-transitional-job-and-training-program.html>