

Which matching models can we trust to recover the marginal willingness to pay for environmental amenities?

Vartan Kesiz Abnousi Virginia Tech Klaus Moeltner Virginia Tech

Presented at Camp Resources XXIII Wilmington, NC, August 8, 2016.

USDA/NIFA award # 2015-67023-23001.







Project Purpose	Overview 000	Methodology O O	Application O	Preliminary Results O	

## Project Purpose

• evaluate the relative performance of different non/semi-parametric matching method estimators

Project Purpose	Overview 000	Methodology O O	Application O	Preliminary Results O	

## Project Purpose

- evaluate the relative performance of different non/semi-parametric matching method estimators
- extension of Cropper et. al (1988), Kuminoff et. al (2010) and Klaiber and Smith (2010)

Project Purpose	Overview ●00	Methodology O O	Application O	Preliminary Results O	
Restoration Database					

#### Johnson Creek Watershed



Johnson Creek Watershed in Portland, Oregon 1988-2014

Riparian Restoration Restoration Projects Maya Jarrad 2015 Sources Water, Taxlots, Streets: RLIS Discovery Merro, 2014 Restoration Projects: Conservation Registry, 2015 City of Portland BES, 2015 Basemap: ESRI et al.

Project Purpose	Overview ○●○	Methodology O O	Application O	Preliminary Results O	
Restoration Database					



• shading (reduce water temperature)

Project Purpose	Overview ○●○	Methodology O O	Application O	Preliminary Results O	
Restoration Database					



- shading (reduce water temperature)
- remove invasives, enhance habitats

Project Purpose	Overview ○●○	Methodology O O	Application O	Preliminary Results O	
Restoration Database					



- shading (reduce water temperature)
- remove invasives, enhance habitats
- reduce erosion, flood risk

Project Purpose	Overview ○●○	Methodology O O	Application O	Preliminary Results O	
Restoration Database					



- shading (reduce water temperature)
- remove invasives, enhance habitats
- reduce erosion, flood risk
- improve recreational opportunities

	Project Purpose	Overview 00●	Methodology O O	Application O	Preliminary Results O	
Restoration Database	Restoration Database					

#### Impact on Property Values?



	Project Purpose	Overview 00●	Methodology o o	Application O	Preliminary Results O	
Restoration Database	Restoration Database					

#### Impact on Property Values?



• Innovative matching estimators

Project Purpose	Overview 000	Methodology ● ○	Application O	Preliminary Results O	
Methodology					

• Iterated Bidding Algorithm (IBA) Kuminoff and Jarrah (2010)

Project Purpose	Overview 000	Methodology ● ○	Application O	Preliminary Results O	
Methodology					

- Iterated Bidding Algorithm (IBA) Kuminoff and Jarrah (2010)
- calibrate the preference parameters of home buyers

Project Purpose	Overview 000	Methodology ● ○	Application O	Preliminary Results O	
Methodology					

- Iterated Bidding Algorithm (IBA) Kuminoff and Jarrah (2010)
- calibrate the preference parameters of home buyers
- capture the marginal willingness to pay (MWTP)

Project Purpose	Overview 000	Methodology ● ○	Application O	Preliminary Results O	
Methodology					

- Iterated Bidding Algorithm (IBA) Kuminoff and Jarrah (2010)
- calibrate the preference parameters of home buyers
- capture the marginal willingness to pay (MWTP)
- compare performance of different matching estimators against this benchmark

Project Purpose	Overview 000	Methodology ○ ●	Application O	Preliminary Results O	
Methodology					



• force within-zone matches, OR

Project Purpose	Overview 000	Methodology ○ ●	Application O	Preliminary Results O	
Methodology					



- force within-zone matches, OR
- correct for spatial effect in auxiliary regression (Abadie and Imbens, 2011), OR

Project Purpose	Overview 000	Methodology ○ ●	Application O	Preliminary Results O	
Methodology					



- force within-zone matches, OR
- correct for spatial effect in auxiliary regression (Abadie and Imbens, 2011), OR
- new 2-stage bias-corrected matching estimator (2SBCME) (Jed Cohen et al 2016)

Project Purpose	Overview 000	Methodology ○ ●	Application O	Preliminary Results O	
Methodology					



- force within-zone matches, OR
- correct for spatial effect in auxiliary regression (Abadie and Imbens, 2011), OR
- new 2-stage bias-corrected matching estimator (2SBCME) (Jed Cohen et al 2016)
- only option in many cases

Project Purpose	Overview 000	Methodology O O	Application ●	Preliminary Results O	
Application					



Home Sales in Portland Area, 1988 - 2014

• 164,353 properties

Project Purpose	Overview 000	Methodology O O	Application ●	Preliminary Results O	
Application					



Home Sales in Portland Area, 1988 - 2014

- 164,353 properties
- 379,497 transactions

Project Purpose	Overview 000	Methodology 0 0	Application ●	Preliminary Results O	
Application					



Home Sales in Portland Area, 1988 - 2014

- 164,353 properties
- 379,497 transactions
- HMDA, census spatial demographic information

Project Purpose	Overview 000	Methodology 0 0	Application ●	Preliminary Results O	
Application					



Home Sales in Portland Area, 1988 - 2014

- 164,353 properties
- 379,497 transactions
- HMDA, census spatial demographic information
- distance to 209 restoration projects

Project Purpose	Overview 000	Methodology O O	Application O	Preliminary Results ●	
Calibration					

### Preliminary Results - Calibration



Simulated and Actual Prices PDF N=200

Project Purpose	Overview 000	Methodology 0 0	Application O	Preliminary Results 0	Next



• Recover true MWTP for variety of interventions

Project Purpose	Overview 000	Methodology O O	Application O	Preliminary Results O	Next



- Recover true MWTP for variety of interventions
- Estimate capitalization rates for different matching models

Project Purpose	Overview 000	Methodology O O	Application O	Preliminary Results O	Next



- Recover true MWTP for variety of interventions
- Estimate capitalization rates for different matching models
- Compare the relative performance of the models based on bias and efficiency

Project Purpose	Overview 000	Methodology 0 0	Application O	Preliminary Results O	Next



#### THANK YOU!



Project Purpose	Overview 000	Methodology ○ ○	Application O	Preliminary Results O	Next
2SBCMF					

• 2-stage Bias Corrected Matching Estimator (2SBCME)

Project Purpose	Overview 000	Methodology ○ ○	Application O	Preliminary Results O	Next
2SBCME					

- 2-stage Bias Corrected Matching Estimator (2SBCME)
- First stage: Estimate confounding effects

Project Purpose	Overview 000	Methodology ○ ○	Application O	Preliminary Results O	Next
2SBCME					

- 2-stage Bias Corrected Matching Estimator (2SBCME)
- First stage: Estimate confounding effects
- Second stage: Differenced out from the second stage treatment effect

Project Purpose	Overview 000	Methodology ○ ○	Application O	Preliminary Results O	Next
2SBCME					

- 2-stage Bias Corrected Matching Estimator (2SBCME)
- First stage: Estimate confounding effects
- Second stage: Differenced out from the second stage treatment effect
- (b) only feasible if the matched control observations are spread over all relevant spatial units such that unobserved effects can be estimated in the auxiliary regression

Project Purpose	Overview 000	Methodology O O	Application O	Preliminary Results O	Next
25BCME					

- 2-stage Bias Corrected Matching Estimator (2SBCME)
- First stage: Estimate confounding effects
- Second stage: Differenced out from the second stage treatment effect
- (b) only feasible if the matched control observations are spread over all relevant spatial units such that unobserved effects can be estimated in the auxiliary regression
- 2SBCME becomes necessary in cases where many of the potential control observations are ineligible for matching estimation