



**AgEcon** SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*

Aggregate Resource Extraction: Examining Environmental Impacts on  
Optimal Extraction and Reclamation Strategies

Brett Campbell; Vic Adamowicz  
Resource Economics and Environmental Sociology, Land Reclamation  
International Graduate School, University of Alberta  
[bacampbe@ualberta.ca](mailto:bacampbe@ualberta.ca)  
[vic.adamowicz@ualberta.ca](mailto:vic.adamowicz@ualberta.ca)

Selected Poster prepared for presentation at the Agricultural & Applied  
Economics Association's 2014 AAEA Annual Meeting, Minneapolis, MN,  
July 27-29, 2014.

Copyright 2014 by Brett Campbell and Vic Adamowicz. All rights reserved.  
Readers may make verbatim copies of this document for non-commercial  
purposes by any means, provided that this copyright notice appears on all  
such copies.

# Aggregate Resource Extraction: Examining Environmental Impacts on Optimal Extraction and Reclamation Strategies

*Brett Campbell; Vic Adamowicz*

*Resource Economics and Environmental Sociology, Land Reclamation International Graduate School, University of Alberta*

## Abstract

- Aggregate resources are deposits of sand, gravel and crushed stone that are used to construct everything from roads and sidewalks to hospitals and schools
- Mining these resources is a source of negative environmental externalities (e.g. dust, noise, visual impacts)
- Negative externalities generated from extraction should be considered when making locational and reclamation decisions

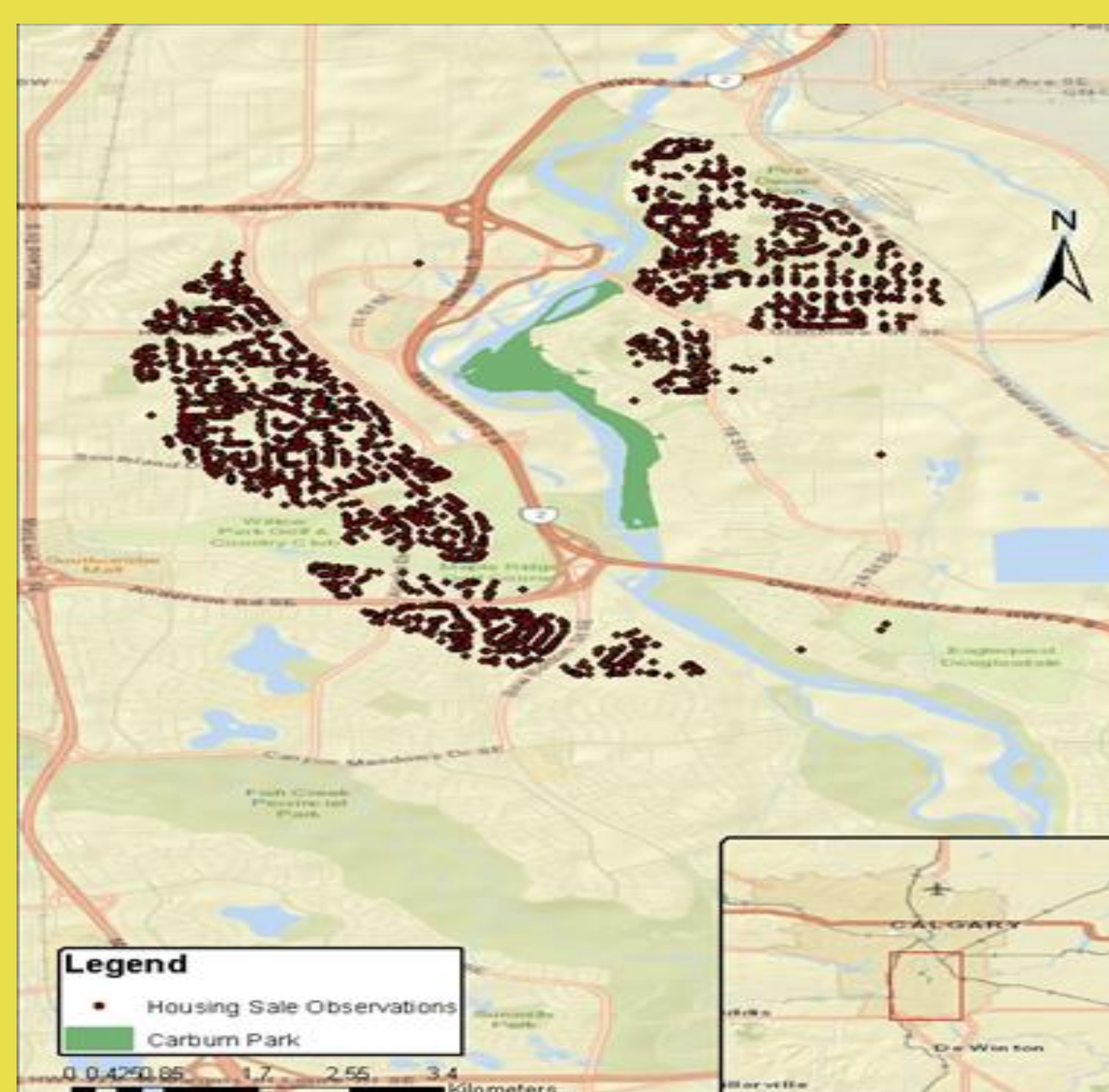


Figure 1: Map of properties surrounding Carburn Park in 1985

## Methods

- Simple property value analysis to measure impact of negative externalities of nearby households (Ihlanfeldt and Taylor 2004)

$$P_{it} = \alpha + \sum_{j=1}^J b_j X_{jit} + c_1 ID_i^B + c_2 ID_i^A + \varepsilon_{it}$$

where  
 $P_{it}$  = log of transaction price of property  $i$  at time  $t$ ,  $t=1981-2010$ ,  
 $X_{jit}$  =  $j$  property characteristics of property  $i$  in time  $t$ , including location-oriented variables,  
 $ID_i^B$  = inverse distance from property to the park, if sale occurred before the mine closure,  
 $ID_i^A$  = inverse distance from property to the park, if sale occurred after the mine closure,  
 $\varepsilon_{it}$  = random error.

- Time fixed effects and difference-in-difference (DID) model to address some challenges associated with using basic hedonic models (Muehlenbachs et al. 2012)

DID Parameters	
Treatment	All houses within a radius of 2 KM are included
Control	Houses beyond the 2 KM radius
Time Period 1	All housing sales having occurred before 1985
Time Period 2	All housing sales having occurred during or after 1985

- Treatment area for DID analysis determined using significant dates relating to the mine's existence
- The study site is Carburn Park in Calgary, Alberta
- The time period examined is before and after the mine closed in 1985, and was subsequently reclaimed

## Data and Results

- Data provided by the Calgary Real-Estate Board
- Structural characteristics (e.g. number of bedrooms, age of house, etc.) and housing sale values
- Interaction terms that relate the inverse distance of the property to the park, and if sold before or after mine closure
- Approximately 7000 home sales between 1981-2010
- The interaction term for before the mine closure is negatively significant, indicating a greater distance from the site causes price to increase (Table 1)
- This effect is reversed once the mine closes and is reclaimed into Carburn Park
- The DID parameter is positive and significant, indicating a significant impact on housing values from the gravel mine which disappears once production ceases (Table 1)
- Fixed effects analysis was used as a robustness check and yielded qualitatively similar results

Table 1: Hedonic model and difference-in-difference analysis results of property characteristics on log(price) near Carburn Park

Attribute	OLS (SE)	DID (SE)
Inverse Distance Before	-0.08468*** (0.0198)	N/A
Inverse Distance After	0.043089*** (0.0031)	N/A
Period 2: After	N/A	0.05260*** (0.0111)
Treatment	N/A	-0.00395 (0.0054)
Treatment *After	N/A	0.05483*** (0.0032)
Presence of Air Conditioning	0.02449*** (0.0119)	0.02618*** (0.0118)
Waterfront	0.1515 (0.0525)	0.18016** (0.0519)
Presence of Basement	0.00909 (0.09568)	0.03342 (0.0945)
Presence of Garage	0.05637 (0.0115)	0.07120** (0.0114)
Size of Garage	0.043376*** (0.0064)	0.03901*** (0.0064)
Single Family House	0.16947*** (0.00757)	0.14851*** (0.0075)
Deck or Balcony	0.02857*** (0.0043)	0.03108*** (0.0043)
Area of Home	0.00188*** (0.0001)	0.00197*** (0.0001)
No. Bedrooms	0.00928*** (0.0028)	0.00687*** (0.0028)
No. Bathrooms	0.06573*** (0.0894)	0.07049*** (0.0040)
Fire Place	0.06210*** (0.0041)	0.06084*** (0.0040)
Age of House	-0.00299*** (0.0001)	-0.00283*** (0.0001)
Constant	11.77936*** (0.0135)	11.73852*** (0.0161)
R <sup>2</sup>	0.66	0.67
n	6941	6941

P<0.01=\*\*\*, P<0.05=\*\*, P<0.1=\*

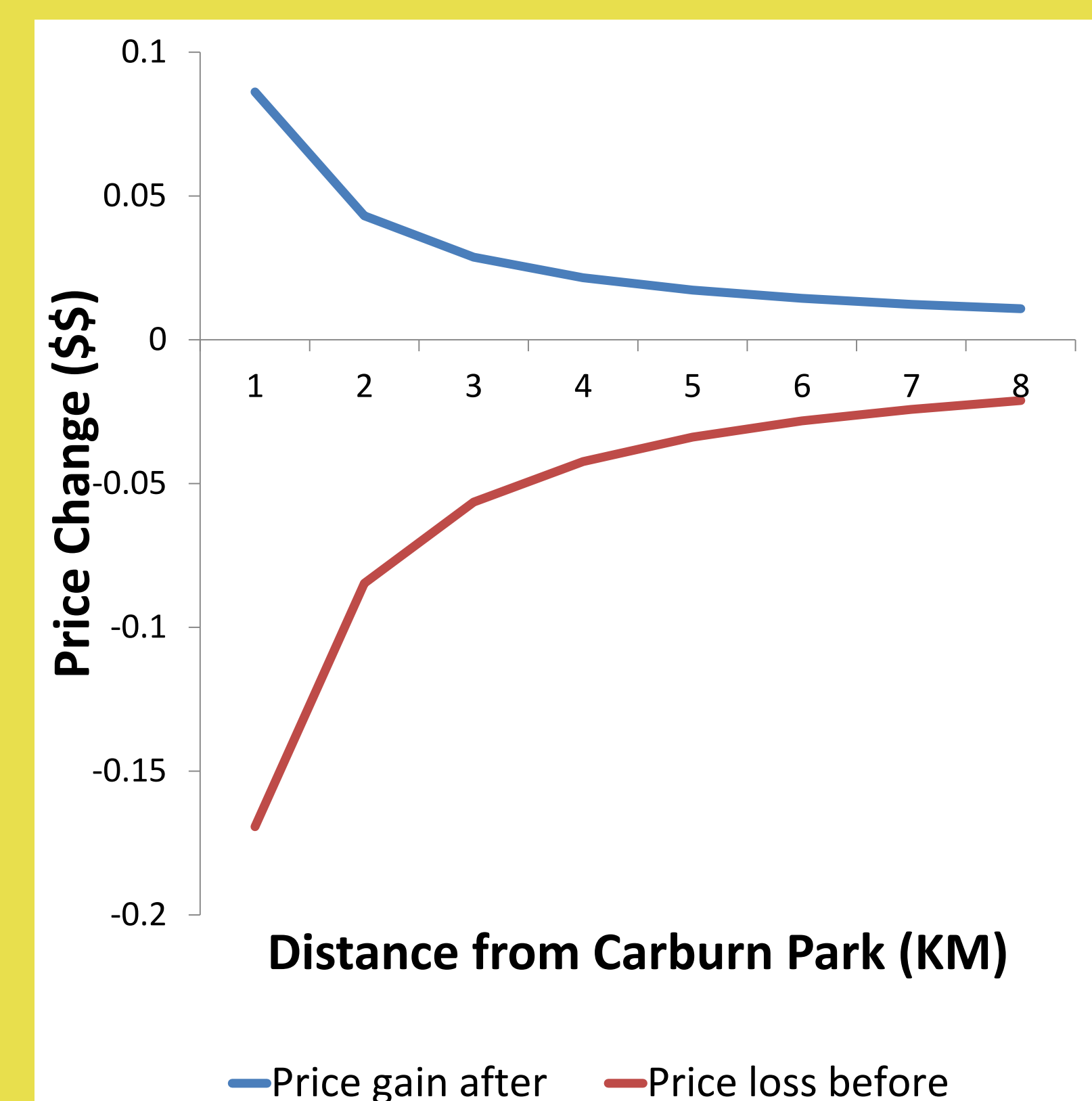


Figure 3: Estimated price change versus distance from Carburn Park



## Conclusions

- Environmental externalities generated from aggregate resource extraction have a significant negative impact on property values surrounding Carburn Park
- The effect is eliminated when the mine closes and is immediately transformed into a park
- Results used in simulation model to assess location decisions and reclamation timing

## References

Ihlanfeldt, K. R., and L. O. Taylor. 2004. "Externality effects of small-scale hazardous waste sites: evidence from urban commercial property markets." *Journal of Environmental Economics and Management* 47(1):117-139.

Muehlenbachs, L., Spiller, E., & Timmins, C. 2012. *Shale Gas Development and Property Values: Differences across Drinking Water Sources* (No. w18390). National Bureau of Economic Research.

## Acknowledgements



Funding provided by the NSERC CREATE program and the Land Reclamation International Graduate School